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Health Impacts of Social Transition: A study of Female Temporary Migration and its impact on Child Mortality in Rural South Africa.

by

Mark Andrew Collinson

A dissertation submitted to the
School of Public Health, University of the Witwatersrand,
in fulfillment of the requirements for the degree of

Master in Science in the branch of Medicine

Acornhoek, May 2006

DECLARATION

I, Mark Andrew Collinson, declare that this research report is my own work. It is being submitted for the degree of Master in Science in the branch of Medicine, in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

……..

…….. day of ……., 2007

PUBLICATIONS AND PRESENTATIONS ARISING

FROM THE DISSERTATION

M.A. Collinson, S.M. Tollman, M. Garenne, and K. Kahn. 2001. "Temporary female migration and labour force participation in rural South Africa." Working paper of the Agincourt Health and Population Unit, School of Public Health, University of the Witwatersrand; Medical Research Council/ Wits Rural Public Health and Health Transitions Research Unit.

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J. Hargreaves, M.A. Collinson, K. Kahn, S.J. Clark, and S.M. Tollman. 2004. "Childhood mortality among former Mozambican refugees and their hosts in rural South Africa." *International Journal of Epidemiology*, 33:1-8.

K. Kahn, M.A. Collinson, J. Hargreaves, J., S.J. Clark, S.M. Tollman, 2005. "Socio-economic status and child mortality in a rural sub-district of South Africa". In: Measuring Health Equity in Small Areas – Findings from Demographic Surveillance Sites. p67-85. Ashgate Publishing UK, ISBN: 07546 4496 0.

M.A. Collinson, S.M. Tollman, K. Kahn, S.J. Clark, M. Garenne. 2005. Highly prevalent circular migration: households, mobility and economic status in rural South Africa. In: Tienda, M., Findlay S.E., Tollman, S.M., Preston-Whyte, E. (eds) 'African Migration in Comparative Perspective', Wits University Press, Johannesburg. (in press)

M.A. Collinson, A. Jonson, K. Kahn, M. Lurie, S.M. Tollman, B. Wolff. 2005. Health consequences of migration: Evidence from South Africa's rural northeast (Agincourt) In: Tienda, M., Findley S.E., Tollman, S.M., Preston-Whyte, E. (eds) 'African Migration in Comparative Perspective', Wits University Press, Johannesburg. (in press)

ABSTRACT

Health Impacts of Social Transition: A study of Female Temporary Migration and the impact on Child Mortality in Rural South Africa.

by Mark A. Collinson

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Temporary migration, especially men moving to their place of work, was an intrinsic feature of the former Apartheid system in South Africa. Since the demise of Apartheid an increasing proportion of women have also been migrating to their place of work, and oscillating between work place and home. Temporary migration can be defined as oscillating migration between a home base and at least one other place, usually for work, but also for other reasons like education. This study demonstrates that in the Agincourt study population, in the rural northeast of South Africa, adult female temporary migration is an increasing trend. By conducting a survival analysis, the study evaluates the mortality outcomes, specifically infant and child mortality rates, of children born to female temporary migrants compared with children of non-migrant women. Based on the findings presented we accept the null hypothesis that there is presently no discernable impact (positive or negative) of maternal temporary migration on infant and child mortality. There seems to be a slight protective factor associated with mother's migration when tested at a univariate level. However, through multivariate analysis, it is shown that this advantage relates to the higher education status of migrating mothers. When women become tertiary educated

there is a survival advantage to their children and these women are also more likely to migrate. The study highlights greater child mortality risks associated with settled Mozambicans (former refugees) and unmarried mothers. Both of these risk factors reflect the impact of high levels of social deprivation.

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TABLE OF CONTENTS

Declaration i
Publications and presentations arising from the dissertation ii
Abstract iii
Acknowledgments v
Table of Contents viii
List of figures xi
List of Tables xii
Glossary of technical terms xiv

Chapter 1 1
The Question and the context 1
1.1 Introduction 1
1.2 Population Characteristics of the Study Area 6
1.2.1 Location 6
1.2.2 Population description 6
1.2.3 Fertility trends 7
1.2.4 Mortality trends 8
1.2.5 Migration and employment 8
1.2.6 Housing conditions 9
1.2.7 Education Service provision 9
1.2.8 Health service provision 10

Chapter 2 11
Methods used in the Agincourt Health and Demographic Surveillance System 11
2.1 Health and Demographic surveillance 11
2.2 Census modules 12
2.3 Data quality 13
2.4 Community relationships 15
2.5 Ethical considerations 16
2.5.1 Community consent 16
2.5.2 Informed consent 17
2.5.3 Data Security 17

Chapter 3 19
Methods used in the study of migration 19
3.1 Introduction 19
3.2 Definition of a household 21
3.3 Definition of a temporary migrant 22
3.4 How temporary migration is managed in the Health and Demographic Surveillance System 22
3.5 Definition of a permanent migrant 23

3.6 How permanent migration is managed in the Health and Demographic Surveillance System 23

Chapter4 24
A Descriptive analysis of Migration in the Agincourt sub-district 24
4.1 Introduction 24
4.2 Methods for this chapter 24
4.3 Key Findings 30
4.3.1 Migration profiles by age and sex 30
4.3.2 Trends in migration 33
4.3.3 Overall/ comparative picture of migration in the sub-district 34
4.4 A discussion on the migration patterns in the Agincourt sub-district and the health impacts on sending households 42

Chapter5 46
A descriptive analysis of Female Temporary Migration 46
5.1 Introduction 46
5.2 Methods for this chapter 48
5.3 Key Findings 48
5.3.1 Employment status of adult female temporary migrants 48
5.3.2 Type of work of adult female temporary migrants 49
5.3.3 Marital Status of adult female temporary migrants 51
5.3.4 Number of living children of adult female temporary migrants 52
5.3.5 Destinations of female temporary migrants 53
5.3.5 Duration of migration for female temporary migrants 54
5.3.6 Patterns of returning home for female temporary migrants 55
5.3.6 Time since last communication for female temporary migrants 56
5.4 A discussion on female temporary labour migration and the possible implication for children 57

Chapter 6 62
The Impact of Female Temporary Migration on Child Mortality 62
6.1 Introduction 62
6.2 Study Design 66
6.3 Analytic Approach 67
6.3.1 Analytic framework 68
6.3.2 Variables used in the survival analysis 69
6.3.2.1 Gender of household head 70
6.3.2.2 Nationality of household head 71
6.3.2.3 Age of mother 71
6.3.2.4 Mother's education 71
6.3.2.5 Marital status 72
6.3.2.6 Number of co-resident children 72
6.4 Survival Analysis Results 76
6.4.1 Overall Childhood Mortality 76

6.4.2 Risk factors for childhood mortality 77
6.4.3 Multivariate analysis of factors associated with child mortality 79
6.4.3.1 Mother's death 79
6.4.3.2 Mother's temporary migration 80
6.4.3.3 Marital status 80
6.4.3.4 Education Status 81
6.4.3.5 Gender of household head 81
6.4.3.6 Nationality of household head 82
6.4.3.7 A Comprehensive model 82
6.5 Summary of findings 82
6.6 Limitations in the survival analysis 90
6.6.1 Missing mother child link 90
6.6.2 Handling factors changing over time 91

Chapter 7 92
General discussion 92
7.1 The importance of the question 92
7.2 The hypothesis test result 92
7.3 Mother's education status 93
7.4 Poverty 93
7.5 The strength of social networks 93
7.6 Mozambicans 94
7.7 Gender of household head 95
7.8 Marital status 95
7.9 Young adult women, temporary migration and employment 96
7.10 Health and economic outcomes of female temporary migration 97
7.11 HIV and migration 99
7.12 The generalisability of the findings 101
7.13 Summary and conclusion 102

Appendix 1: Map showing the Bushbuckridge District, Limpopo Province, and the Agincourt field-site 105
Appendix 2: The Agincourt Health and Population Unit: Origins and Aims. 106
Appendix 3: Challenges in the study of migration at Agincourt 109
References 111

LIST OF FIGURES

Number *Page*

Figure 1: Woman enquiring about bus-fare on a 'City-to-City' bus, Acornhoek, 2004 xxii

Figure 2: A woman is responsible for the children of her temporary migrant sister 5

Figure 3: Migration rates: Permanent migrations within the same village, by age, sex and period, Agincourt, 1994 – 1998 and 1999 – 2003. 36

Figure 4: Migration rates: Permanent migrations between rural villages, by age, sex and period, Agincourt, 1994 – 1998 and 1999 – 2003. 37

Figure 5: Migration rates: Permanent migration into a rural village from a more urbanized settlement type, by age, sex and period, Agincourt, 1994 – 1998 and 1999 – 2003. 38

Figure 6: Migration rates: Permanent migration out of a rural village to a more urbanized settlement type, by age sex and period, Agincourt, 1994 – 1998 and 1999 – 2003. 39

Figure 7: Migration rates: Temporary migrations, by age, sex and period, Agincourt, 1994 – 1998 and 1999 – 2003. 40

Figure 8: Type of work of employed temporary migrant women, by age groups 15-34 and 35-54 years, 2002 50

Figure 9: Hierarchical framework for analyzing the impact of maternal presence on childhood mortality (from Mosley and Chen, 1984 [28]) 74

Figure 10. Survival function of children during the first five years of life, Agincourt, 1992 - 2000 85

LIST OF TABLES

Number *Page*
Table 1: Reasons for move: Permanent migrations within the same village. 36
Table 2: Reasons for move: Permanent migrations between villages. 37
Table 3: Reasons for move: Permanent migrations into a rural village from a more urbanized settlement type. 38
Table 4: Reasons for move: Permanent migrations out of a rural village to a more urbanized settlement type. 39
Table 5: Reasons for move: Temporary migrations. 40
Table 6: Reason for move by all migration types, Agincourt, 2002. 41
Table 7: Employment status of adult female temporary migrants, by age groups 15-34 and 35-54 years, 2002 49
Table 8: Occupation and employment sector by age group of employed female temporary migrants, 2002 51
Table 9: Marital status of female labour migrants, by age groups 15-34 and 35-54 years, 2002. 52
Table 10: Number of living children of temporary migrant woman, by age groups 15-34 and 35-54 years, 2002 53
Table 11: Destination of temporary migrant women, by age groups 15-34 and 35-54 years, 2002 54
Table 12: Duration of female temporary migration by age groups 15-34 and 35-54 years, 2002 54
Table 13: Patterns of home return of female temporary migrants, by age groups 15-34 and 35-54 years, 2002 56
Table 14: Time since last communication of female temporary migrants, 2002 57
Table 15: Entry and exit to open cohort of children aged 0-5 yrs, total size = 30633 children 73
Table 16: Exposure variables used in the survival analysis 75
Table 17: Univariate Poisson regression analysis on potential risk factors for childhood mortality 86
Table 18: Impact of mother's death on the risk of child death for children aged 0-5 years 87
Table 19: Impact of mother's migration status on the risk of child death for children aged 0-5 years 87
Table 20: Impact of mother's migration and marital status on the risk of child death for children aged 0-5 years 87
Table 21: Impact of mother's migration, marital status and education status on child death for children aged 0-5 years 88
Table 22: Impact of mother's migration, marital status and gender of household head on child death for children aged 0-5 years 88

Table 23: Impact of mother's migration and nationality of household head on child death for children aged 0-5 years 89
Table 24: Impact of mother's migration and education status on child death for children aged 0-5 years..... 89
Table 25: Impact of mother's migration, marital status, nationality of household head and age of mother on child death for children aged 0-5 years..... 90

GLOSSARY OF TECHNICAL TERMS

Child mortality rate

The rate of death in children aged 0-5 years, obtained by comparing the number of children who die within this age group, over a specified time period, to the number of 'person years at risk' contributed to the population by children aged 0-5 years (i.e. the sum of time in years that each child was 'exposed' to this population). From their fifth birthday onwards children can no longer form part of the numerator, however the 'person years at risk' they contributed, while exposed to the population during ages 0-5 years, will be added to the denominator.

Cox regression

Cox regression is a 'proportional hazards' model for estimating the effects of different exposure variables. At the time of each death, the values of the exposure variables for the subject who experienced the death are compared to the values of the exposure variables for all subjects still being followed who did not experience a death. The model assumes that the hazard ratio (i.e. the relative risk of dying), comparing exposed and unexposed subjects, remains constant over time [1].

De facto household definition

A household definition that includes people physically present at the time of the survey, but excludes linked household members who are not present. Commonly, national censuses employ a de facto household definition.

De jure household definition

A household definition that includes people physically present at the time of the survey plus linked household members who are not present at the time of the survey. The Agincourt health and population information system employs a de jure household definition.

Education status of mother

This is a variable used in the survival analysis in this dissertation. The education status of the mother can have the values: “none”, “primary”, “secondary” and “post-matriculant”. “None” implies no formal schooling; “primary” implies some primary level schooling; “secondary” implies some secondary level schooling; and, “post-matriculant” implies some tertiary level education. This variable was obtained in interviews in 1992, 1997 and for all in-migrants on the date of cohort entry. Thus, in the survival analysis it is a partly time-changing variable with a maximum of one change possible during the observation interval.

Gender of household head

This is a variable used in the survival analysis in this dissertation. It represents the sex of the household head as recorded in the Health and Demographic Surveillance System (HDSS). It is a variable that can change with time since a household head can die or out-migrate, and then be replaced by a new household head of a different sex. The HDSS data allows this variable to change over time in the survival analysis.

Hazard ratio

This is an indicator of relative risk (in this case of child mortality) obtained by comparing the rates of child death in the different categories of risk factor or 'exposure variable'.

Household

The Agincourt definition is as follows: the social group who reside and eat together, plus the linked temporary migrants, who would eat with them on return (i.e. a de jure definition).

Incidence rate ratio (IRR)

An incidence rate ratio is a form of hazard ratio which compares the incidence rate (in this case the incidence of child mortality) for the different categories of risk factor or 'exposure variable'.

Infant mortality rate

This is an indicator of mortality risk in children aged less than one year, obtained by comparing the number of children aged less than one year who died in a given year, with the total number of children who were born in that year.

In-migration ratio

This migration rate measures in-migrations in the numerator over the denominator of 'person years' exposure in the population. It is a ratio rather than a true rate, because an in-migrant may have an origin outside the study area. Then, a person who moves in can be counted in the numerator, having not been part of the actual population at risk of moving, i.e. the denominator. This deficiency does not detract from the value of using this migration rate in the descriptive analysis of in-migrations, and the density of migration activity by sex and age group.

Kaplan Meier Survival Curve

The Kaplan Meier curve displays the probability of survival as a function of time. This method calculates the estimated survival probability at time, t, by considering the individuals still being studied at each time, t, (i.e. the population at time t) and assessing the probability of death within this risk set [1].

Logistic regression

Logistic regression estimates the relative effects of the various risk factors on a binary dependent variable, providing odds ratios for the different categories of risk factor or 'exposure variable'.

Marital status of mother

This is a variable used in the survival analysis in this dissertation. The marital status of the mother can have the values: 'never married', 'married', or 'divorced/separated'. 'Married' is the marital status where a person has fulfilled all the requirements (legal, religious or traditional) to recognise that she is permanently sharing her life with another person. In data collection it is a self-reported status. This variable has limitations because although it is time-changing variable, the Agincourt Health and Demographic Surveillance System is not geared to recording these changes. The variable is measured at the time of the mother's entry into

the cohort and not measured thereafter, thus for the survival analysis the variable is fixed at that point in time.

Nationality of household head

This is a variable used in the survival analysis. It indicates whether the household head is of Mozambican or South African nationality. In data collection it is a self-reported status. The likelihood of change is low and the variable is given a fixed value at the time of mother's entry into the cohort.

Out migration rate

This is a migration rate measuring out-migrations in the numerator over the denominator of 'person years' exposed in the population. It is a true rate because the numerator events are a sub-set of the population at risk.

Permanent migration

This is defined in the Agincourt Health and Demographic Surveillance System as a person leaving or entering an Agincourt household with a permanent intention. The definition excludes temporary migrants, whom do not leave a household with permanent intention, and retain significant links. In data collection, a permanent out-migrant is removed from the household roster, but a temporary migrant not.

Poisson regression

Poisson regression allows the estimation of rate ratios (comparing exposed and unexposed groups) by defining the log rate as a function of the exposure variables. This method is recommended when the proportional hazards ratio (i.e. the relative risk of dying) changes over time, as it does in this under five age group studied in this dissertation [1].

Survival Analysis

A survival analysis uses a longitudinal study design in which individuals are followed over time, from the time exposure begins, to the occurrence of a disease or death [1].

Temporary Migration

This is defined in the Agincourt Health and Demographic Surveillance System as migration of a household member who is away for the majority of the time, but retains a significant link to the same household, including regular communication and physical return. This implies that the person is a de jure member of the household, but is absent for more than six months of a year. This variable, called residence status, may be time-changing and is evaluated annually on every member of the study population.

Temporary Migration Rate

This migration rate measures the proportion of temporary migrants as a sub-set of the whole population at the time of the census. Thus, a person who was a temporary migrant for four years would contribute four to the numerator and the full de jure residence to the denominator. It is a true rate but is less temporally accurate than rates based on permanent migration events, which are captured as unique events in time.

Total Fertility Rate (TFR)

The average number of children that would be born alive to a woman (or a group of women) during her lifetime if she were to pass through all her childbearing years conforming to the age-specific fertility rates of a given year.



Figure 1: Woman enquiring about bus-fare on a 'City-to-City' bus, Acornhoek, 2004

C h a p t e r 1

THE QUESTION AND THE CONTEXT

1.1 Introduction

This dissertation addresses the following question:

'What is the impact of female temporary migration on infant and childhood mortality in the rural Agincourt sub-district of Limpopo Province, South Africa?'

A detailed specification of the question is given on page 66. The question belongs to the literature on the impact of human migration on the households left behind by the migrants, which is part of a larger and more fundamental question: how is society changing in rural Southern Africa, and how does this affect patterns of health and well-being? Knowing where people are sick and dying is critical for planning an adequate public sector response.

It is important to study labour migration in developing world settings since adult migration is a frequent strategy used to enhance income opportunities. Health outcomes for the household left behind have been reported as both positive and negative in different parts of the world. Evidence grows for both scenarios, a summary of which is presented below. The situation is affected by multiple factors operating at different levels of analyses. These include macro level 'structural' changes, e.g. economic opportunities linked to labour market adjustment and affecting rural livelihoods [2-4]; prevailing patterns of health and disease, e.g. exposure to sexually transmitted diseases [5-8], non-

communicable disease and mental stress [2, 3]; social and cultural norms, e.g. the practice of child fostering [9], or the social ties between migrants and their families [10, 11]; and gender norms, e.g. the changing role of women in society [12-14].

The socio-political history of the population also plays an important role; and when examining the question in South Africa it is vital to consider the impact of Apartheid, and its demise, on mobility patterns and social structures [2, 15, 16]. This history is dominated by the mining industry, the rapid industrialisation following the mineral discoveries of the late nineteenth century and the Apartheid-driven 'homeland' system, which restructured the settlement patterns and livelihood strategies of the African population to provide necessary labour, while forcing unemployed family members to remain in densely settled, rural areas.

The infamous and well documented Influx Control, Group Areas Acts, and the pass laws, exerted controls on migration patterns that altered population development in the country by enforcing an impermanence on the urbanisation process of the black population [17-20]. In urban areas these laws resulted in serious lack of urban planning and a diversion of urban settlement into sprawling peri-urban areas [18, 21]. In rural areas people were forced to live in 'homeland' areas, based on a system of ethnic homogeneity. Access to land was further restricted by a process of villagisation [22]. Ultimately, these forces yielded a transition from an agrarian to a cash-based rural economy [20], but a poor, rural economy that engendered continual labour migrations and large numbers of disunited households split into rural and urban components. Thus, migration has had a key role in

the success of the South African economy, while placing an immense burden on the rural population. This ‘double edge’ of economic success has been expressed as follows:

> *‘The very process that guaranteed wealth in the economy (i.e. the migrant labour system) simultaneously produced poverty and patterns of unemployment that still hobble South Africa…’ [23].*

The last two decades have seen major changes in the arena of politics, with the repeal of the pass laws occurring in 1986, after political struggle was waged against them for over a century [23]; the birth of democracy in 1994; and in macro-economics, the liberalisation of markets, which, together with a plummeting gold price, have led to a net loss of jobs over this entire transition period [24]. All of these changes are likely to have had an impact on labour migrations and the lives of families in both urban and rural areas.

Between July 2000 and April 2001, Mr. Zola Skweyiya the South African Minister of Social Development undertook an extensive tour of the country’s rural regions, with the aim of assessing the delivery of social services. At a national conference the minister reported his impressions as follows:

> *"I found that the breakdown of family and community life as a result of Apartheid remains a persistent feature. Poverty, unemployment and the devastating impact of HIV/AIDS have resulted in greater fragmentation, alienation and hardship for many. Our traditional forms of social solidarity have become eroded." [25]*

It has been postulated that labour migration has played, and continues to play, a significant role in this indictment [2, 26, 27], but the evidence to scientifically examine the hypothesis are not easily found.

The question is addressed in this dissertation in four stages. Chapters two and three describe the methods used in the Agincourt Health and Demographic Surveillance System (chapter 2) to record the population dynamics of the sub-district population of Agincourt, and provide more detail on the method used for conducting population migration research (chapter 3). Secondly, a descriptive analysis is undertaken exploring the patterns of mobility found in the Agincourt sub-district (chapter 4). This aims to isolate temporary migration from other forms of migration to give a sharper focus to what is being analysed. Thirdly, a descriptive analysis is presented of female temporary migration (chapter 5) to deepen the picture of the phenomenon under analysis. Finally, the pieces are in place for addressing the main question statistically using a longitudinal survival analysis on a cohort of children and their mothers living in the Agincourt sub-district (chapters 6 and 7). Several social factors potentially impacting on childhood mortality are examined in univariate and multivariate statistical models, based on a classic model of child mortality described by Moseley and Chen [28].



Figure 2: A woman is responsible for the children of her temporary migrant sister

1.2 Population Characteristics of the Study Area

1.2.1 Location

The study population is located in the Agincourt sub-district of the Bushbuckridge district of the Limpopo Province of South Africa, some 500km northeast of Johannesburg. See Appendix 1 for a map of the area. As maps indicate, the study site is adjacent to the Mozambique border and hence the area can also be considered a border region of rural South Africa.

1.2.2 Population description

Using data from the Wits/MRC[1] Agincourt Health and Population Unit this section describes the population characteristics of the study area. In 2003 the total surveillance population was 70 154 people living in 11 600 households, with a population density of 172 persons per square kilometre. The male: female sex ratio for the de jure population was 0.929. The dependency ratio was high at 92,3 (compared with 51.7 in the United States population of 1990 [29]), with 44% of the Agincourt population under 15 years of age and 4% over 65 years [30] (compared with 21.5% and 12.6% respectively in the US 1990 population [29]). The main ethnic identity was Shangaan, with some resident Pedi and Swazi language speakers. Mozambicans comprised more than a quarter (29%) of the

[1] Medical Research Council /University Unit in Rural Public Health and Health Transitions Research, School of Public Health, University of the Witwatersrand

total population. Mozambicans are also Shangaan speaking and are culturally affiliated to the South African host population.

Mozambicans arrived as refugees in South Africa as the civil war in Mozambique escalated in the late 1980's. On arrival they dispersed within local settlements or settled on land allocated to them by local tribal authorities. In 1993, group refugee status was granted to Mozambicans who had fled the conflict, yet access to water, sanitation, labour markets and legal rights has remained persistently poor for most [31]. The group is thus vulnerable in many respects, but, nonetheless, uptake to voluntary repatriation programmes has been low [32].

1.2.3 Fertility trends

The fertility transition in this part of South Africa has almost concluded over a period of 25 years [33]. Total fertility rate (TFR) averaged 6.0 in 1979, and dropped to 2.4 in 2003. In 1999 the Agincourt TFR was 2.8 which was comparable to the level recorded in the South African Demographic and Health survey in 1998. The fertility levels have declined proportionately in all age groups, including adolescents in the recent period [33]. There is still however a high rate of adolescent fertility in the midst of escalating HIV sero-prevalence. Garenne et al described how age-specific fertility shows a bi-modal pattern with pre-marital peak around age 18 and a marital fertility peak around age 27 [34].

1.2.4 Mortality trends

The leading causes of death revealed by verbal autopsy, a field based interview with the closest care-giver of the deceased to establish the probable cause of death (described on page 12) [35], are diarrhoea, kwashiorkor and AIDS in children under five; accidents, violence and AIDS in the 15-49 age group, and chronic degenerative diseases, mainly cardiac, cerebro-vascular, liver and malignant diseases, among those fifty and above. Mortality patterns have shifted over the observed decade with an overall trend of increasing mortality. An under-five mortality decline started reversing in 1996, and was still on the increase at the end of the decade. This has primarily been caused by HIV/AIDS. Mortality has also been rising in the younger adult age group from the same cause. There has also been an unexpected rise in mortality risk in adults over 50, particularly women, due in large part to strokes and congestive cardiac failure [36-38].

1.2.5 Migration and employment

Formal employment involves migrant men working mainly in the mining sector (gold, diamonds and coal in particular), in construction and security firms of larger towns, as well as on nearby farms. Women make up an increasing proportion of the migrant labour population (see Chapter 5 of this dissertation for details). An important source of local employment is the public sector. Informal sector activities are widespread, and include mainly food and fruit vending. Unemployment at age 25 years is 50% of men and 35% of woman (wanting to be employed) [39]. Pensions are an important source of income for many families. Female headed households constitute 32% of all households. Recent changes in government have affected movement patterns. With more freedom of

movement people are tending to move to nearby towns. These towns are becoming development nodes along tarred roads throughout rural areas [40].

1.2.6 Housing conditions

Housing types vary from traditional mud huts to brick dwellings with tin or tiled roofs. Stands are generally too small to support subsistence agriculture. Crops are grown, but this merely supplements the family diet. Water is pumped to the main reservoirs in the villages, seldom via a purification plant. From the reservoirs it is reticulated to the communal taps, which serve as the main collection points for village community members. Water is collected manually by women or children, who usually carry it in 25litre drums, by wheelbarrow or balancing on the head. Water shortage poses a serious problem in most villages. Levels of household sanitation are poor, and pit toilets of varying effectiveness are the norm. All roads are untarred. Public transport is limited to privately owned mini-bus taxis. Electricity and telephone services have expanded in recent years.

1.2.7 Education Service provision

Almost all villages have at least one primary school and approximately one in two villages have a secondary school. Although school enrolment often occurs late, 85% of children aged 10-14 years enter primary school. Less than 50% continue to secondary school, however, and only 3% receive post-secondary education. Adult female literacy (56%) is somewhat lower than adult male literacy (62%) [41]. There are mainstream

Christian churches, independent African churches and an amalgamation of traditional and Christian beliefs is often practiced.

1.2.8 Health service provision

A health centre with five satellite clinics exist in the field-site, all staffed by nurses. A restricted number of drugs are dispensed from each of these primary care facilities. An ambulance is based at the health centre. All services are free, and include child health, family planning, antenatal care, delivery and post-partum care, minor ailments and chronic disease treatments. Although waiting times are long, most of these services are under-utilised. A contributing factor is long-standing poor drug supply. Referrals are to two district hospitals, each about twenty-five kilometres from the health centre. Since late 2005 antiretroviral treatment has been available at the district hospitals.

Chapter 2

METHODS USED IN THE AGINCOURT HEALTH AND DEMOGRAPHIC SURVEILLANCE SYSTEM

2.1 Health and Demographic surveillance

Appendix 2 (page 106) outlines the origins and aims of the Agincourt Health and Population Unit, now the MRC/ Wits University Unit in Rural Public Health and Health Transitions Research, and describes the rationale for health and demographic surveillance [42]. The primary tool of health and demographic surveillance is a rigorous annual update of the demographic status of every member of a geographically-defined population, namely the Agincourt sub-district of the Bushbuckridge District. This comprises 21 villages. A baseline census was conducted in 1992. Since then updates have been conducted, collecting information on all births, deaths and in- and out-migrations in the surveillance population. A field operation is mounted each year to visit each of the almost 12 000 households in the sub-district interviewing the best respondent available, who must be adequately knowledgeable of the status of household events. During this interview the fieldworker verifies existing records—records new data pertaining to individuals or the household—and records the demographic events that have occurred since the preceding year's census update [36, 41, 43]. Enquiry into the demographic events experienced by each household members are supplemented by a full maternity history of all in-migrant women aged 15-55 years, as well as residence histories, and other modules built into the census listed in the next section.. The census update is conducted by four census teams of five fieldworkers each with a supervisor who

scrutinizes GIS[2]-based maps listing every dwelling in the area. The maps are kept up to date by taking GPS[3] readings of new dwellings each year. A verbal autopsy is conducted on each death to establish the cause. The verbal autopsy interview is conducted by a trained lay fieldworker in the vernacular, i.e. Shangaan, and assessed by medical practitioners to establish the main cause of death, as well as immediate and contributing causes [35-37, 41, 43]. In this way longitudinal database of demographic events has been established and appended over time.

2.2 Census modules

In each census round one or two detailed modules are conducted to provide information on socially relevant areas to supplement analyses within the modalities of the Unit's research programme. A full module usually fits onto one A4 sheet and contains some fifteen to thirty relevant variables. The variables are selected due to their recommendation in current scientific literature and knowledge of the local population. Since brevity and salience are key the modules are iteratively workshopped and piloted before the field stage starts. Some cross-sectional modules are repeated, with different periodicities depending on the expected pace of change, to allow for some longitudinal analysis of key population variables, like unemployment rate, household economic status, uptake of child care grants, etc. The list below includes some screening questions which were used in the census to identify particular conditions as a form of active case-finding to establish population prevalence rates. Generally, if the census fieldworker identified a

[2] Geographic Information System

[3] Global Positioning System

case then a specialized team would follow afterwards to confirm the case. Examples included ‘cough’ status to screen for untreated tuberculosis, and ‘weakness down one side’ questions to identify stroke survivors.

In December 2005 the following status observations were available for scientific work: residence status (updated every round), education status (updated 1992, 1997, 2002 and new individuals), present cough (1999 – one screening question), labour status (2000 and 2004– census module), asset status (2001, 2003, 2005 – census module), stroke survivors (2001 – two screening questions), temporary migration status (2002 – census module), child social care grants in household (2002, 2005- census module), health care utilisation (2003 – census module), food security status (2004- census module), vital documents (2005–one screening question), marital status – current and historical (2005 – census module)

The methods of the Temporary Migration module in 2002 will be expanded in the next chapter. This is important because the data is used in chapter 5 to give a descriptive analysis of female temporary migration.

2.3 Data quality

The fieldworkers mentioned in 2.1 above are all matriculants or higher-educated local community members who have been selected for skills in languages, numeracy and community involvement. Initiatives to ensure quality occur on several levels in the field and data room. Quality is emphasized during training and a high standard interview is

expected. Procedures include targeted skills development and training before each census round, supervised visits on household interviews to improve interviewing skills, and form checking at several levels. The fieldworker checks their own batch of completed census forms at the end of each day, then they check each other's forms within the team once a week, and errors are either dealt with in the field office or a revisit is done. The forms are controlled by the supervisors who conduct random quality checks and register forms on supervision sheets. Successful forms pass on from the team supervisors to designated "quality checkers" who are based in the central field office. Here a final check is conducted on every form and any forms with errors are returned to the field for resolution. In addition, random duplicate visits are conducted by the team supervisors on 1.5% of the population to assess data quality by comparison with the original interview conducted by the fieldworker.

Data entry is conducted in a field office within the study area. A further level of checking is done by the computer data entry programme which checks for data consistency as it is captured onto the computer. Data typists enter the form and the data is checked against a series of validation rules that are triggered by the data attempting to enter the database. These errors are assessed by the data supervisor, and returned to the field if necessary.

In earlier years of the database some live births followed by early deaths were probably miscounted. An attempt to minimise the missing of neonatal deaths was undertaken by recording on the census form the name of the last born child for each woman; this was to act as a prompt at the time of the interview, to double check that there had been no pregnancy since the birth of the last born child.

An improvement to the migration database initiated in 2002 was migration reconciliation, which involves tracking internal migrants who move within the study site to link up the places of origin and destination for each move. The process involves checking that the person leaving the place of origin and entering the place of destination are the same person. This has also been a mechanism for checking the integrity in the database and clearing up problem cases. It aims to erase the possibility of having the same person registered in two places at the same time, and also enables people to keep the same unique identifier when they move.

The next chapter is devoted to the methods used in the Agincourt Health and Population Unit for recording migrations in the demographic surveillance database. This will inform the methods behind the migration data presented in chapter four on migration profiles, as well as the migration data used in the main survival analysis in chapter six.

2.4 Community relationships

A partnership between the Agincourt Health and Demographic Surveillance System, the study communities and the local health services has been a priority from the outset and considerable time is devoted to explaining the purpose of the surveillance work and its associated projects. Before any project commences a series of meetings are held in each village with community members and leadership. Information from the Health and Demographic Surveillance System and related research initiatives are disseminated in the study communities by printed “village fact sheets” and by community meetings. Over the years the community feedback meetings have become well attended and the discourse

between community members and project representatives has reached level that shows a high general understanding about the project. Through these meetings not only are research findings disseminated, but also contact details of service providers, both government and non-government. Where possible representatives from service providers are also present at the meeting to contribute information and participate in the dialogue raised by the research findings. Information is also disseminated to district and regional health service managers in relevant fora, such as the district's Independent Development Programme (I.D.P) committee. Findings are also addressed to provincial and national Departments of Health with aim of contributing to health policy debates.

2.5 Ethical considerations

The University of the Witwatersrand's Committee for Research on Human Subjects (Medical) has reviewed and approved the health and demographic surveillance system research protocol (no. M 960720).

2.5.1 Community consent

The research infrastructure is embedded in the community arising from over a decade of village meetings and household visits. The relation ships take time to build and require constant nurture. The nature of the relationship from the outset has been that research findings will be shared on an on-going basis with local communities, and that the project will contribute to identifiable improvements in the area. This on-going dialogue has contributed substantially to the almost negligible non-response rate during repeated

censuses; and the community preparation, feedback and dialogue process has become a key feature of the project.

2.5.2 Informed consent

The principles of informed consent are respected, and the right of refusal to be interviewed, at the individual and household level. Fieldworkers are trained to carefully explain their purpose to the residents of the household and, where a respondent declines to participate, to accept this graciously.

2.5.3 Data Security

Data is captured in a secure computer room located in the Agincourt village onto an isolated local area network. The database is secured using two levels of user access control: a password to log onto the operating system, and a second password to log into the database. A hierarchy of database access exists with only the field research manager and data manager having full access. Access to the data is controlled by the unit data manager to make secure, anonymised data available for students and scientists. A data agreement is signed between the two parties to ensure protection and appropriate acknowledgement for the production of the data.

The Agincourt health and demographic surveillance system database was first held in FoxPro in the mid-1990's, but was re-written into Microsoft Access 95 with an improved data model in 1996. In 1999 an upgrade was made to Access 97, with a data model brought up to the standards of the INDEPTH population reference data model [44]. In

2001 a further database upgrade was made converting the operational database into Microsoft SQL Server. This last upgrade enabled a high standard of database technology, including data protection and improved means of querying the database.

Chapter 3

METHODS USED IN THE STUDY OF MIGRATION

3.1 Introduction

In developing world countries, rural-urban linkages often take the form of temporary migration, also known as 'oscillating', or 'circular' migration [45]. Temporary migration involves the periodic movement of individual household members, usually to major urban centres, to work or look for work, but who retain major and continuing links with the rural home [9, 46]. Other reasons for temporary migration include education and child fostering. Family networks are an important factor that facilitate temporary migration between city-based and village-based households [10]. If there are only two places involved the migration may referred to as bipolar, of which conventional labour migration would be a good example. However, current research in South Africa describes a fluency of movement between rural and urban bases not properly reflected in conventional bipolar models of labour migration [9]. Migrants may travel between multiple residences where they could be resident for a range of time periods.

The strong links between rural and urban households in South Africa were described in a study by Warren Smit in 1998 [47]. He sampled households in five representative low-income settlements in metropolitan Durban. The results showed that 57% of the 244 household heads interviewed had migrated from rural to urban areas. The primary reason given for this settlement type was to look for work, to escape political conflict and to avoid a personal conflict at home. Of these, 48% had strong links with a rural area,

defined as coming from a rural area, still owning a rural home, visiting there once a month, sending money back, and/ or having children still living there. A further 32% had weak rural links, where the head of the household came from a rural area and visited there during holidays, and 18% no longer had any rural links. Another way of describing these mobility patterns is to say that 39% of household heads belonged to "multiple-home" households. The typical picture was of a household located in the urban area, where the economically active members and most of their children lived, and a rural household where the non-economically active members lived.

There are several advantages of Health and Demographic Surveillance System methodology in the study of migration and health and these advantages obtain to this study. The surveillance system brings exhaustive coverage of demographic events within a geographically defined population. This includes 'longitudinal integrity', i.e. the time dimension is carefully represented in the database structure. The definitions of household and migration are built into the data collection process itself. When a fieldworker is told about a person moving into or out of a household a primary decision is made whether it is a permanent or a temporary migration, and the two are handled differently by the fieldworker, and in the database.

For analytic purposes the permanent and temporary migration streams can be further differentiated. For example, permanent migration can be divided by destination and origin types to create a typology of permanent migration streams. This is the analytic framework used in chapter 4. Another way of dividing permanent migration categories is

to indicate whether the migration is internal to the study site, thus a distinction could be made between ‘local mobility’ and ‘migration proper’.

Further analytic possibilities using demographic surveillance system data include the prospective plotting of demographic trends (e.g. chapter four), targeted studies which exploit a range of comparative groups (e.g. chapter five), and longitudinal analyses such as survival analysis (e.g. chapter six).

3.2 Definition of a household

The definition of a household in the Agincourt Health and Demographic Surveillance System is a group who reside and eat together, plus the linked temporary migrants who would eat with them on return. This is a de jure household definition because it is more closely related to links of responsibility within the household, as opposed to a de facto household definition which more closely matches the co-residential household, as used in the national census. One implication of the Agincourt definition in data collection is that when a field worker encounters a permanent out-migrant this person becomes removed from the household resident list, whereas a temporary migrant is retained on the household list.

3.3 Definition of a temporary migrant

A temporary migrant is a household member who is away the majority of time, but retains a significant link to their base household. In analysis, a six month per year cut –off point was chosen to differentiate 'temporary migrants' from 'local residents'. Thus, people who are referred to as temporary migrants were absent from the household for more than six months of the year preceding observation, but who considered the index household to be their home base.

3.4 How temporary migration is managed in the Health and Demographic Surveillance System

Temporary migration status is based on 'resident months' status which records the amount of time each person is physically present in the household during the year preceding the census interview. The fieldworker hears the account of a person's residence pattern and adds the residence episodes together, rounds this up to a whole number and records this as the number of months that a person was present in the previous year. This variable, i.e. 'resident months' has been updated in successive census rounds in 1992, 1995, 1997, 1999, 2000, and annually since then. Based on the 'resident months' variable a fieldworker also records a 'residence status' variable. This is derived from 'resident months' but contains slightly more information. "Resident status" has four categories, namely, 'Local resident', if 'resident months' is between six and twelve months; 'Temporary Migrant', if 'resident months' is less than six and the reason for absence is work-related; 'Other Temporary Migrant' if 'resident months' is less than six and the reason is not work-related; lastly, a 'Visitor' is if a person was present at the

census but should not be considered part of the household. A child born or in-migrated in the year prior to the census is considered a 'local resident' if the household informant considered their residence to be permanent despite the number of resident months.

3.5 Definition of a permanent migrant

The Agincourt definition of permanent migrant is a person who enters or leaves a household with a permanent intention of entering or leaving. This definition closely follows the classic definition that migrants are people who experience a change in residence [48]. This includes people who leave the index household and establish a household or join a household elsewhere. A key feature is that the destination household becomes the new home base for the migrant. The main reasons given in the Health and Demographic Surveillance System for permanent migration are: "union formation or dissolution"; "to live with another" and "new dwelling for household".

3.6 How permanent migration is managed in the Health and Demographic Surveillance System

A permanent migrant is either in- or out-migrated. An out-migrant is removed from a household (i.e. a social group) and a dwelling (i.e. the physical infra-structure), and an in-migrant is moved into a household and dwelling. Technically, a migrant is added or removed from a household by starting or ending a membership episode in the household, and simultaneously starting or ending a residence episode at the dwelling. The salient details of the migration event, e.g. "date of move", "origin" or "destination", are captured and stored in the migration table.

C h a p t e r 4

A DESCRIPTIVE ANALYSIS OF MIGRATION IN THE AGINCOURT SUB-DISTRICT

4.1 Introduction

Permanent and temporary migration are both prevalent in this community. Therefore, it is a valuable scientific exercise to describe in some detail the profiles of these types of migration.

The aim of the chapter is to give a finely grained description of migration in the sub-district as it is critical to understand the phenomenon we are studying. The first approach is to compute the age sex prevalence rates of five different migration 'streams'. These rates will show the frequency of migration events occurring as a function of the population at that time. The rates are also produced for two successive periods, namely 1994 to 1998 and 1999 to 2003. This is to get a sense of how the migration profiles are changing over time, i.e. the trends in these migration streams. Lastly, a comparative table of the reasons for migration is given by the same migration types.

4.2 Methods for this chapter

The first necessary categorization of migration is to divide population movement into temporary and permanent migration. The definitions of these broad types, and how they

are collected within the health and demographic surveillance system are given in chapter 3. For this descriptive chapter we want to show how the profiles of temporary migration compare to those of permanent migration, in order to improve our understanding of temporary migration which we go on to examine in more detail in subsequent chapters. Permanent migration is divided into four mutually exclusive 'streams', or categories. To achieve this the places of origin and destination of the migration were used. *Migration within a rural village* occurred when the movement was between two places (a destination and origin) within the same village. The Health and Demographic Surveillance System records separately the in-migration and out-migration events of this type of move. For the analysis we took the in-migration event to be the best data from which to characterise the event, because the migrant was living in the destination household at the time of the interview, so the data was likely to be more accurate. *Migration between rural villages* was when the migration occurred either between two villages in the study site or from a rural village into a study site village, or from a study site village to another rural village in the district. These two categories represent forms of local mobility, i.e. occurring at the same level of a rural: urban settlement continuum. The third category of permanent migration was *into a rural village from a more urbanized settlement type.* This involved migration into a study site village from somewhere further away than a local village. Places of origin in this category spanned a wide range of settlement types including small towns along the district main road, medium sized towns in adjacent districts and provinces, provincial capital cities, or the major national metropolis in Guateng. This category thus represents migration 'towards rural' in a rural: urban settlement continuum. The fourth category of permanent migration was *out of a*

rural village into a more urbanized settlement type. This involved moving out of a rural village to somewhere further afield than another rural village and represents migration 'towards urban' in a rural: urban continuum. *Temporary migration* is an independent, mutually exclusive category of movement, that follows the HDSS definition, i.e. a person leaves the de jure 'home' (in the study site) without a permanent intention and does not break ties with it, but regularly returns and remains connected in a variety of ways. This last category typically captures labour migration and other forms of temporary, though 'longer term', migration.

The migration categories used in the chapter can thus be summarized as follows:

1. Migration within a rural village
2. Migration between rural villages
3. Migration into a rural village from more urbanized settlement type
4. Migration out of a rural village into a more urbanized settlement type
5. Temporary migration out of a rural village

To construct age-sex prevalence rates of the different migration types a different method was used for the permanent migration and temporary migration, since the former is recorded as an event occurring at a given date, and the latter, being a circular process, is recorded as a residence status that is evaluated each year. The prevalence rates of permanent migration were computed using a straightforward demographic approach. This involved computing the number of events by migration category, in each period, by five year age groups, and by sex. Then, as denominator, the number of 'person years' was computed by summing the amount of time each person contributed to the de jure

population, by age group, sex and period. These calculations were done in Microsoft Access using group queries to sum up events and person years in the different categories, and make the necessary constraints to define the categories. For temporary migration prevalence rates the numerators for each year were the number of people, by age group and sex, who were defined as temporary migrants at a given annual census, with the denominators the total number of people, by age-group and sex, in the de jure population at the time of that census.

As a result of these methods the collective term of 'prevalence rates' actually incorporates three slightly different measures: 1) 'in-migration ratios', which are used in the first three migration categories, where the in-migrations recorded in the numerators are not necessarily subsets of the 'population-at-risk-of-moving', but represent moves into this population; 2) true 'out-migration rates', in category four, where the numerator is a subset of the 'population-at-risk-of-moving'; and 3) temporary migration rates, which give the population proportions of temporary migrants at successive censuses. Nevertheless, the measures are directly comparable as indicators of the density of migration in the five migration types, by age group, sex and period.

To further categorise migration in this population a descriptive analysis of the reasons for migration was conducted for each mutually exclusive migration type. Reason for move is recorded for each permanent migration captured in the HDSS. Generally, 'reason for move' of the temporary migrants is not recorded in the HDSS, but a special module was conducted in 2002, as described in chapter 3, in which temporary migrant's 'reason for

move' was obtained. For this analysis the permanent migration categories were also restricted to that year, i.e. 2002, to enable a more direct comparison and give a reasonable 'snap-shot' of the movement types by reason. For both permanent and temporary migrations 'reason for move' was captured using a pre-defined 'reason' code, with the option of 'other', where the reason was recorded in text if a respondent's explanation did not match one of the pre-coded categories. Reasons were re-coded, from the pre-defined categories and specified text, to establish nine comparable and mutually exclusive categories of 'reason for move' across all migrations.

The nine 'reason for move' categories were as follows:

1. "Union formation or dissolution". This is where the migration occurs as the formation of a new social union between two human beings, either as formal marriage or as 'living-together', or the breakdown of such a union.

2. "To live with another". This is when a person leaves the original de jure household and moves into another de jure household with the reason being that there is a family link between the two households. Multiple reasons prevail in this type of move, but the characteristic is that the locus of residence for a person changes to another household in the family network. The 'reason for move' category "school/study" is excluded here although it is actually a sub-set of this migration flow, to show migration for education as a discrete stream (see reason 7 below).

3. “New dwelling for the household” is where a whole household leaves a dwelling place and relocates to another dwelling place.

4. “Work”, is where the migration is expressly for the purpose of employment.

5. “Looking for work”, is where the migration is in search of an opportunity for employment.

6. “Health”, where some form of healing is expressed as a goal of the migration. Primarily, it involves access to services, both modern and traditional.

7. “School/study”, is a special case of living with somebody else, where educational reasons were expressed by the respondent, or a child of school-going age moved to ‘live with another’ in the family network.

8. “Child accompanies adult”, is a category for children who move in the company of an adult, who in turn is moving for one of the reasons given above. If the child moves without accompanying an adult, for example ‘to live with another’ then it is not recorded in this category.

9. “Other unknown”, is where data is missing or inconclusive in the HDSS records, or when a person is in prison, since this was not frequent enough to warrant a category on its own.

4.3 Key Findings

4.3.1 Migration profiles by age and sex

The age-sex migration profiles of the five distinct migration 'streams' are given in figures 1 to 5 below. A table of 'reasons for move' for each migration stream is given on the same page to help characterize the migration stream. Table 6 on page 41 shows the 'reasons for move', repeated for each migration stream, but this time in a comparable format.

Figure 1 gives the age-sex migration profile of permanent migration within the same village. There is clearly a different profile for males and females and a distinctive age profile. Children under ten of both sexes show a prevalence rate of 30/1000 person years of this kind of migration. The prevalence drops at ages 10 – 14 for both sexes, then climbs steeply for women. The modal distribution is for women aged 15 – 35, which peaks at ages 20-24, at a rate of 43 women per 1000 female person years. The migration rate of males continues to drop by age until the age 25, and between ages 35 and 34 shows a modest peak back at the level of 30/1000 person years. Beyond age 39 the migration rate declines in both sexes, while remaining slightly higher for women. After age 54 the distribution is low, but it appears wavy and erratic. This is due to low numbers of moves in this age group and relative instability in the number of 'person years' in the older age groups.

It can be seem in table 1 that the main reason for this type of move is households moving to a new dwelling, with a large number of children making these moves accompanying

the adults involved. Union formation or dissolution also produces a fair number of these 'within village' moves. There is virtually no such migration for work, schooling or health reasons.

Figure 2 shows the age-sex migration rates of permanent migrations between rural villages. The profile is similar to figure 1 with some notable differences. The dominant sub-group making these kinds of moves is still women aged 15-34, but the prevalence is higher with 57 women per 1000 person years in the age group 20-24 making these migrations. The prevalence of migrant children is also higher at closer to 40 per 1000. The male distribution however has almost lost the mode of migration at age 25-34. The distributions by period will be discussed below in section 4.3.2 under migration trends.

The reason for migration between rural villages has much less to do with household moving into a new dwelling, but focuses on union formation and dissolution. There is still some movement of people to live with other family members and moving into new dwellings. Also, there are a large proportion of children making these 'between village' moves, accompanying their parents.

Figure 3 shows the age-sex prevalence of migrations into a rural village from a more urbanized settlement type. The profile has a similar shape but at a generally lower level of prevalence. Women aged 20-24 are still the most frequently migrant at a level of 27 per 1000 person years. The proportion of males making this kind of move remains low and flat. Children of both sexes are higher at around 20 per 1000 person years.

The reason for moving into a rural village from a more urbanized setting is primarily to stay with a member of the family network, or for union formation or dissolution, or a child accompanying an adult migration. Interestingly, we see a glimmer of 'work' as a reason for move for the first time (4% of these moves).

Figure 4 shows the prevalence rates of permanent migration out of a rural village to a more urbanized setting. The level is higher than the migration stream moving in the opposite direction. Females aged 20-24 are still the modal sub-group at a rate of 33 migrations per 1000 person years. The relative level of children is reduced when compared to the other permanent migration categories. The male distribution is still low and flat, although with a slight mode showing again in the age group 30-34. Migration reasons are fairly evenly distributed with a similar amount of migration for union formation or dissolution, moving to live with another family member and households moving to a new dwelling. A high proportion are still children accompanying the adults.

Figure 5 shows the prevalence of temporary migration by age and sex. For the first time we see a strikingly different profile and levels that are very much higher than all the permanent migration categories combined. The difference in level of migration prevalence is so much greater that the scale on the y-axis is tenfold higher, which is necessary to compare shapes of the profiles in different movement categories without the temporary migrants completely dwarfing the permanent migrations. The male distribution is now highly dominant with a wide modal peak, from age 25 – 55, at the level of more than 500 per 1000 person years, or more than half of the population. The age distribution shows a steep increase in the likelihood of migration after age 19 which does not drop to

below 100/1000 person years until after age 74. The female distribution, although lower then the male level, is much higher then the levels of women conducting permanent migration, with a wide modal peak from ages 25 – 49 at a level of higher than 200/ 1000 person years. This drops under 10% of the population at age 59. The children are much less likely to move than the adults, but still at levels higher then we have seen yet, at around 60 / 1000 person years.

The reasons for temporary migration differ completely from permanent migration. This type of move is largely for employment, education or looking for work. A small proportion move to live with another family member, or as children accompanying a parent move.

4.3.2 Trends in migration

Trends are critical because they give us a sense of where the system is moving over time, and are especially important given the context of social transition during the decade of observation. The longitudinal data allowed a computation of the age-sex migration rates over two periods, namely 1994 to 1998, and 1999 to 2003.

A comparison of migration rates across the two periods indicates some important trends. Overall population mobility has increased, with increases particularly apparent among children aged 0 to 4, temporary and permanent migration in women aged 15 to 49 and temporary migration in young men aged 15-34. Permanent migration of women aged 20-

35 into rural villages, either from another rural village or from further away, has shown a strong upward trend across the period.

Temporary migration age profiles have changed for both sexes. Men aged 15 to 25 were over 20 per cent more likely to migrate temporarily in the later period compared with the earlier. Women aged 15 to 49 showed a strong increase in the likelihood of temporary migration. Within the female increasing trend, the proportion of younger adult women (15 to 29) was growing faster than the proportion of older women making such moves. People in age groups over 50 showed a slight decrease in temporary migration over the period, though the incidence of migration remained very high.

4.3.3 Overall/ comparative picture of migration in the sub-district

Table 6 offers a comparative view of migration by type and reason. This perspective enables an integration of the information we have accumulated one ‘stream’ at a time. Unlike the age-sex-period graphs of migration prevalence rates, which pool data over ten years into two periods of five years each, this table is restricted to one year only, namely 2002. In this year there was an almost full set of data available for all migration streams on the reason for the move.

The first noteworthy feature is a reiteration of the different scale of migration in different migration types. Temporary migration made up 68% (12136 divided by 17848) of all migrations occurring in this population in 2002.

The ‘Total’ column on the right of the table shows the distribution of reasons for move across all migrations. More than half of the 18 000 migrations recorded in that year (58%) were temporary migrations for purposes of work, looking for work or for education. The rest of the distribution was as follows: 8% of migrations were to live with another family member, 6% for union formation or dissolution and 5% for a household moving into a new dwelling. A large proportion of movement (16%) was children accompanying parents for one of the reasons listed above.

In total, 7% of the migrations were for other/unknown reasons. These were mainly in the permanent migration categories. The reason for this is insufficient information being collected in routine annual event updates of the HDSS. The best way to deal with the category is to conceptually allow the unknowns to be distributed across the other categories in a proportional manner.

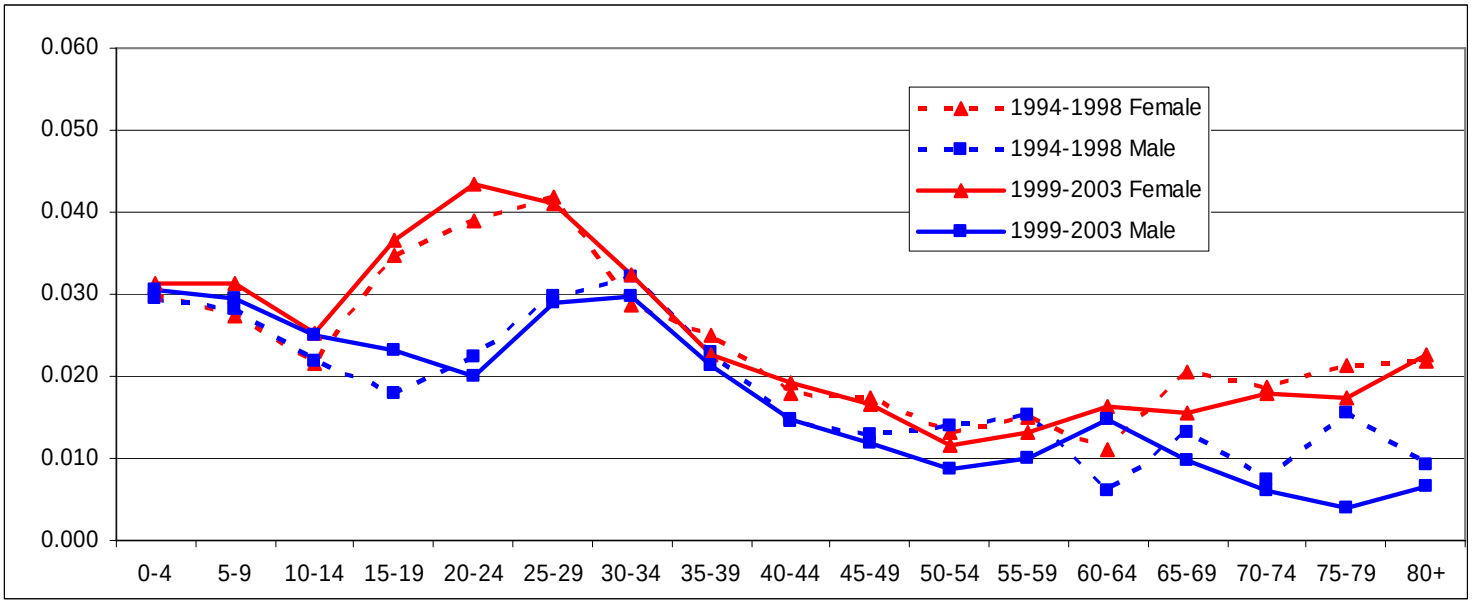


Figure 3: Migration rates: Permanent migrations within the same village, by age, sex and period, Agincourt, 1994 – 1998 and 1999 – 2003.

	Migration within a rural village	
Reason for move[4]	n in 2002	Column %
union formation or dissolution	206	12%
to live with another	134	8%
new dwelling for household	327	20%
Work	3	0%
looking for work	0	0%
Health	0	0%
school/study	2	0%
child accompanies parent move	710	43%
other/unknown	269	16%
Total	1651	100%

Table 1: Reasons for move: Permanent migrations within the same village.

[4] Reasons presented are mutually exclusive in this and subsequent tables (table 2 – table 6)

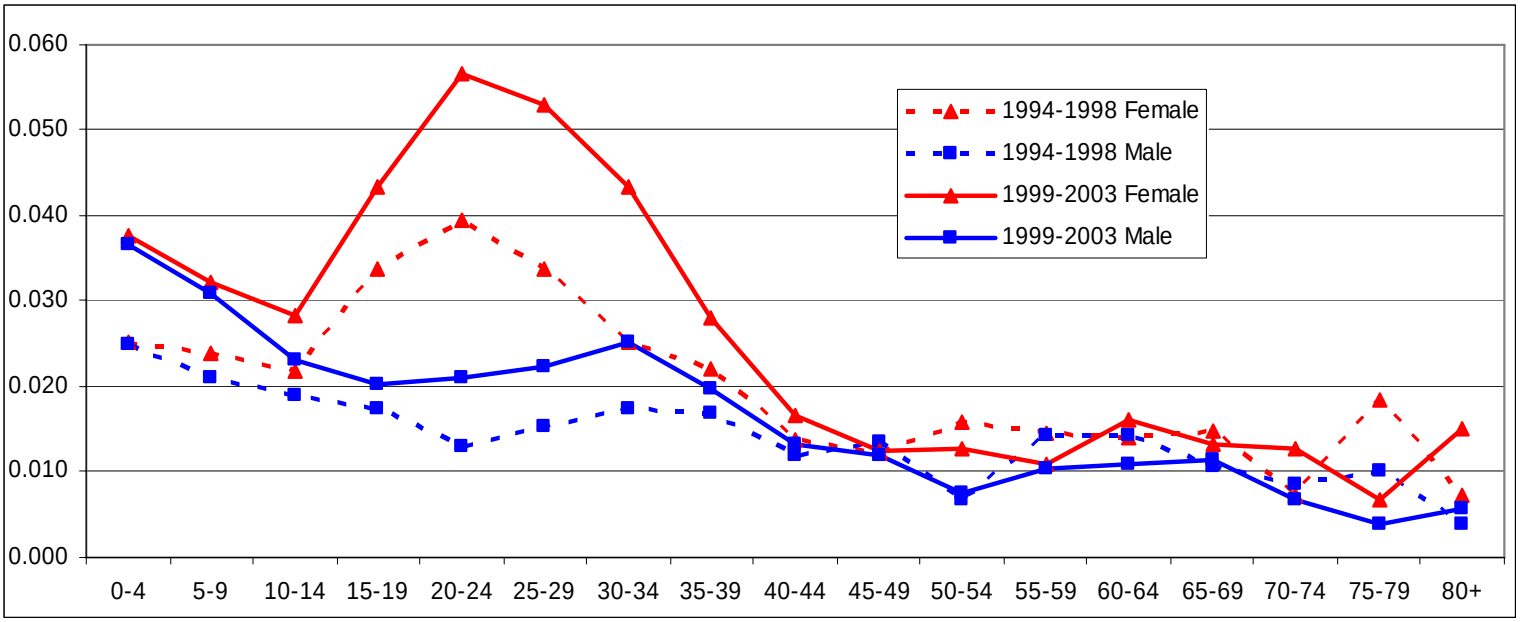


Figure 4: Migration rates: Permanent migrations between rural villages, by age, sex and period, Agincourt, 1994 – 1998 and 1999 – 2003.

	Migration between rural villages	
Reason for move	n in 2002	Column %
union formation or dissolution	375	22%
to live with another	207	12%
new dwelling for household	242	14%
Work	22	1%
looking for work	0	0%
Health	2	0%
school/study	10	1%
child accompanies parent move	583	34%
other/unknown	289	17%
Total	1730	100%

Table 2: Reasons for move: Permanent migrations between villages.

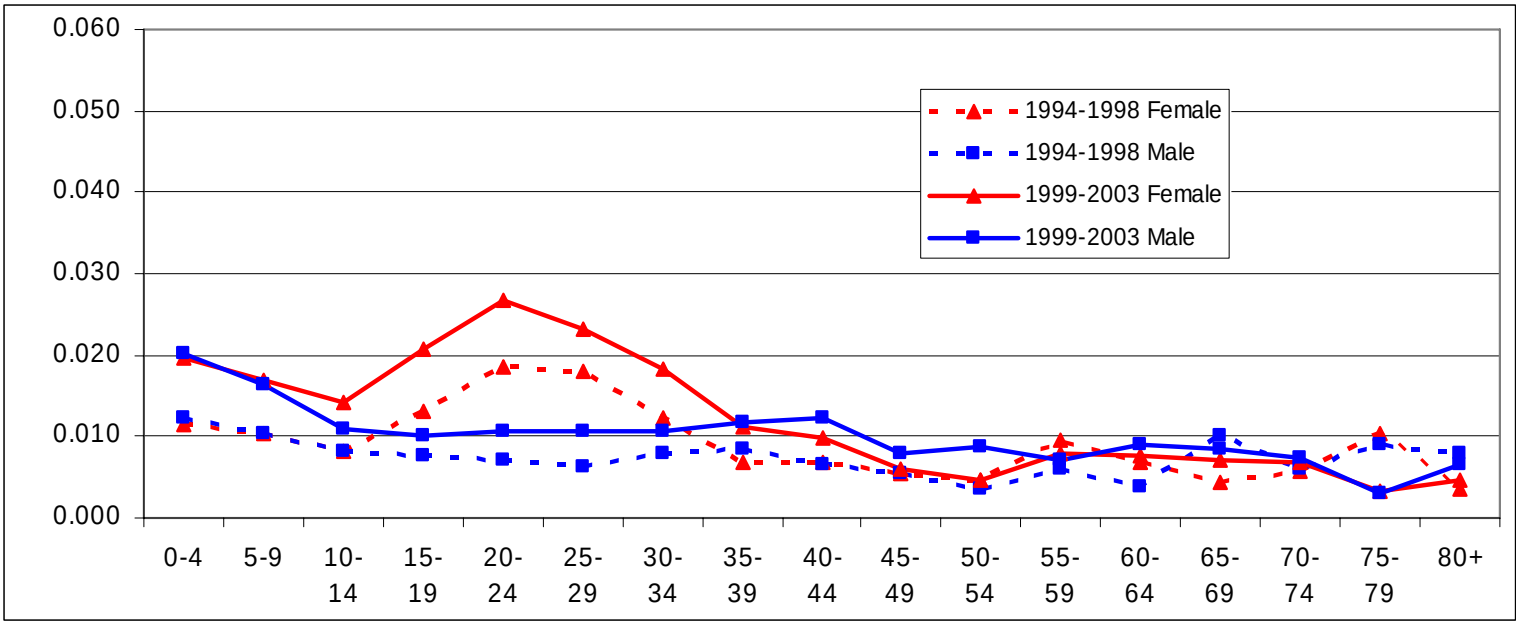


Figure 5: Migration rates: Permanent migration into a rural village from a more urbanized settlement type, by age, sex and period, Agincourt, 1994 – 1998 and 1999 – 2003.

	Migration into a rural village from a more urbanized settlement type	
Reason for move	n in 2002	Column %
union formation or dissolution	188	18%
to live with another	206	20%
new dwelling for household	55	5%
Work	43	4%
looking for work	0	0%
Health	2	0%
school/study	8	1%
child accompanies parent move	289	28%
other/unknown	249	24%
Total	1040	100%

Table 3: Reasons for move: Permanent migrations into a rural village from a more urbanized settlement type.

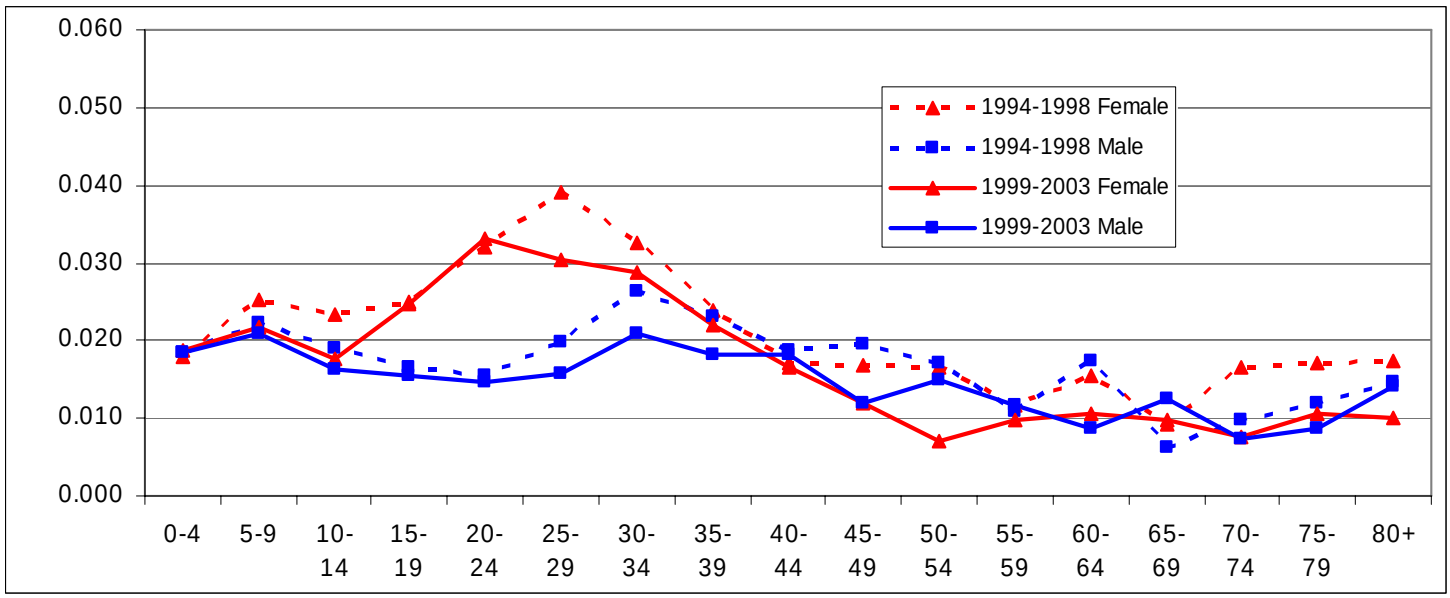


Figure 6: Migration rates: Permanent migration out of a rural village to a more urbanized settlement type, by age sex and period, Agincourt, 1994 – 1998 and 1999 – 2003.

	Migration from a rural village to a more urbanized settlement type	
Reason for move	n in 2002	Column %
union formation or dissolution	228	18%
to live with another	201	16%
new dwelling for household	224	17%
Work	24	2%
looking for work	3	0%
Health	0	0%
school/study	6	0%
child accompanies parent move	414	32%
other/unknown	191	15%
Total	1291	100%

Table 4: Reasons for move: Permanent migrations out of a rural village to a more urbanized settlement type.

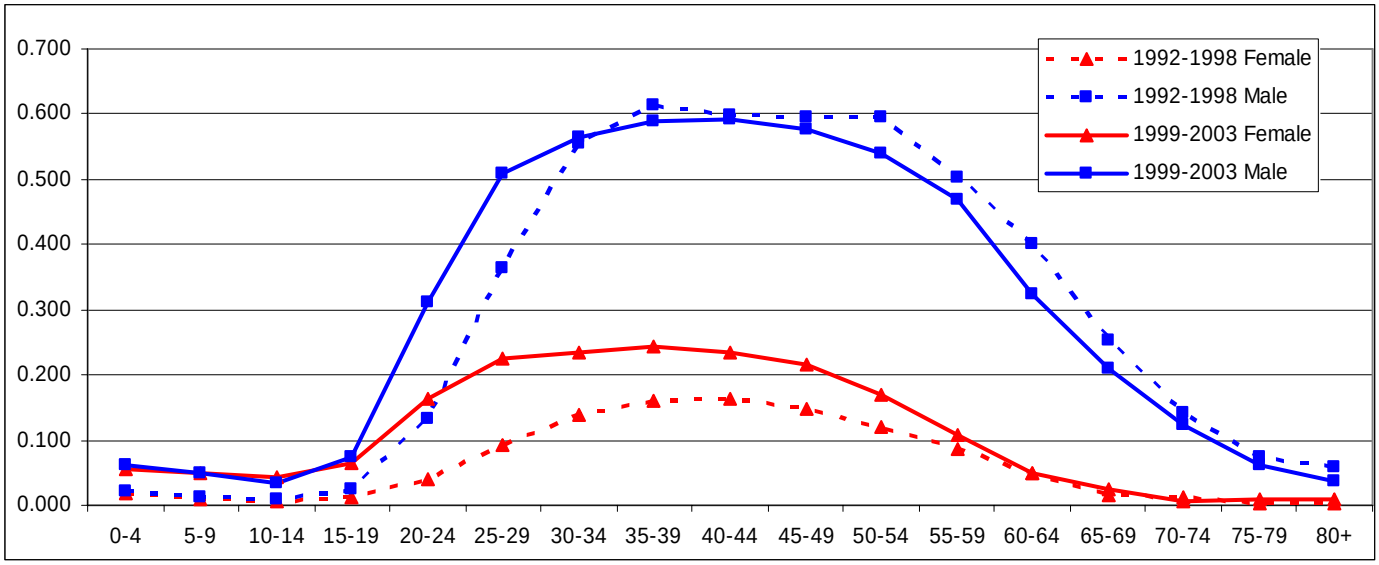


Figure 7: Migration rates: Temporary migrations, by age, sex and period, Agincourt, 1994 – 1998 and 1999 – 2003.

	Temporary migration from a rural village	
Reason for move	n in 2002	Column %
union formation or dissolution	0	0%
to live with another	766	6%
new dwelling for household	0	0%
Work	8005	66%
looking for work	812	7%
Health	21	0%
school/study	1446	12%
child accompanies parent move	876	7%
other/unknown	210	2%
Total	12136	100%

Table 5: Reasons for move: Temporary migrations.

	Migration within a rural village		Migration between rural villages		Migration into a rural village from a more urbanized settlement type		Migration out of a rural village to a more urbanized settlement type		Temporary migration from a rural village		Total	
Reason for move	n in 2002	Column %	n in 2002	Column %	n in 2002	Column %	n in 2002	Column %	n in 2002	Column %	n in 2002	Column %
union formation or dissolution	206	12%	375	22%	188	18%	228	18%	0	0%	997	6%
to live with another	134	8%	207	12%	206	20%	201	16%	766	6%	1514	8%
new dwelling for household	327	20%	242	14%	55	5%	224	17%	0	0%	848	5%
Work	3	0%	22	1%	43	4%	24	2%	8005	66%	8097	45%
Looking for work	0	0%	0	0%	0	0%	3	0%	812	7%	815	5%
Health	0	0%	2	0%	2	0%	0	0%	21	0%	25	0%
school/study	2	0%	10	1%	8	1%	6	0%	1446	12%	1472	8%
child accompanies parent move	710	43%	583	34%	289	28%	414	32%	876	7%	2872	16%
other/unknown	269	16%	289	17%	249	24%	191	15%	210	2%	1208	7%
Total	1651	100%	1730	100%	1040	100%	1291	100%	12136	100%	17848	100%

Table 6: Reason for move by all migration types, Agincourt, 2002.

4.4 A discussion on the migration patterns in the Agincourt sub-district and the health impacts on sending households

The aim of this chapter has been to characterise migration in the sub-district along the axes of age, sex and type of migration, while also indicating the main trends in these distributions. The migration categorization has enabled a more fine-grained picture, so that when we talk about temporary migration we can see which types of moves are involved and which are not. The discrimination between permanent and temporary migration has been vindicated by the descriptive evidence of reason for move. People move permanently for different reasons than moving temporarily. The clearest outcome is that temporary migration is almost equivalent to labour migration, with people moving mainly for the reason of employment. A small proportion of temporary moves are for education or for seeking work. Permanent migration on the other hand involves primarily one of the following three reasons: union formation or dissolution, moving to stay with another family member or moving the whole household into a new dwelling. These are supplemented by child migration where the child accompanies his or her parents.

Age and gender have also done a good job of discriminating migration patterns. Permanent migration is dominated by young adult women, moving alone or with their children, occasionally accompanied by a man. Temporary migration on the other hand is instrumental in removing half of the adult male population from of the area. It is also the reason for the temporary absence of one in five women of child-bearing age, namely 15 to 49 years. Critically for this dissertation, the data has shown that one of the most

striking migration trends is the rapidly increasing proportion of adult female temporary migrants. The consequence of this population trend on child mortality is the main focus of this dissertation.

Social scientists have long been concerned with the effects of temporary or oscillating migration on the areas from which migrants are drawn [2]. A key approach has been the study of social networks and health, which focused on the impact of modern, urban lifestyles on family dynamics [49]. The primary position was that modernisation tended to diminish ties between parents and children, and between migrants and non-migrants in the family. This was a result of increasing urbanisation, education and labour market participation that arose in the shift from traditional agrarian modes of production to modern ones [50].

The literature moved on from modernisation to focus on the wider impacts of labour migration. Two contradictory areas of literature can be found. On the positive side the "new economics of labour" suggested that the migrants move to facilitate income for the household, although he or she may not necessarily move to areas with the highest wages, but to areas that offer short-term economic opportunities that could maximise the needs of both movers and stayers [51]. It could be predicted that migrants would minimize consumption in order to remit earnings back to the origin area [52]. Exchange between movers and stayers in the form of economic or social support had a measurable and typically positive effect on the economic and social well-being of those left behind. This is also borne out by the investment in migration costs of the family left behind [53, 54].

Kuhn, in 2003 [50], presented a study that displayed these positive benefit of temporary migration for the households left behind. The benefit arose from the support extended back to the rural family by the temporary migrants. The study was based in the Matlab area of Bangladesh which is a migrant sending area. The study looked at the impact of children's migration on the health and survival of older respondents residing in the study area.

Kuhn found that both the levels of 'good health' and the measured survival rates were differentiated by, and depended on, the household composition. It ultimately depended on whether the household contained (had links with) a migrant son. The best probabilities of good health and survival of parents were obtained by the households with one internal (domestic) migrant son *and* one international migrant son. It was a huge investment to send an international migrant and required a large commitment from the family group, however the families that managed to send migrants were better off in the outcomes of better health and survival rates [50].

In the Southern African context the system of migrant labour was a cornerstone of Apartheid policy which compelled people to take up wage employment or confine themselves to Bantustans. Here, unable to eke out a subsistence livelihood, they were forced to migrate and offer their labour on white farms, mines and in industry [2] [55]. The Nationalist Government ruthlessly implemented a series of measures designed to regulate supply of labour and to tighten the control of the movement of Africans and of the conditions of their employment [18, 56]. Labourers were forbidden to settle in urban areas with their families and the system of pass laws was instituted to enforce this policy

[57]. In Colin Murray's book, "Families divided: the impact of migrant labour in Lesotho" [2] he states,

'no aspect of village life in Lesotho can be understood without central reference to the dependence of the villagers for their livelihood on earnings derived from the export of labour'.

Murray's book represents the strongly negative view of the impact of migrant labour on rural households. He postulates that a system in which large numbers of men spend long periods away at work, leaving their wives and children at home, 'generates economic insecurity, marital disharmony, material and emotional misery and problems related to sexual morality and legitimacy of children' [2].

Both the 'positive' and 'negative' literature cited above tend to focus on one gender of labour migrant, namely men. Yet our data has shown a high and increasing proportion of temporary migrant women. In the next chapter, we will examine some key attributes of women who migrate temporarily from the Agincourt sub-district. The aim is to further characterise and understand the phenomenon, before analytically examining the impact on child mortality.

C h a p t e r 5

A DESCRIPTIVE ANALYSIS OF FEMALE TEMPORARY MIGRATION

5.1 Introduction

Using data from the 1993 Project on Living Standards and Development and the 1995, 1997, and 1999 October Household Surveys, Dorit Posel has shown that there was a net increase in the proportion of South African rural households containing at least one migrant worker [58]. Overall, in the national population, there was little change in the percentage of adults reported as migrant workers. However, among *rural adults* specifically there was a net increase in labour migration over the period. This was driven by the rise in *adult female migration*. In 1993 women made up 30% of the African adult labour migrant population, but by 1999 this had increased to 34%. Posel and Casale explain these changes by reporting changes in household composition, change in women's marital status and the increasing need for women to enter the labour force in the nineteen nineties [58].

In 2000, Victoria Hosegood and Geoff Solarsh from the Africa Centre conducted in-depth interviews with members of 60 rural households to inform the development of the Africa Centre Demographic Information System in Kwazulu Natal, South Africa [59]. They confirmed that rural areas of South Africa were characterized by highly mobile populations with high rates of circular migration. Migrants were reported to constitute 35% of the total household population, with 41% of the adult and 29% of child members

not co-resident with their rural household. Among the adults this constituted 55% of the males and 28% of the females who were temporary migrants from these households [59].

The details of the household structure of these rural households revealed the large presence of temporary mobility among adults and children. Households with a resident adult constituted 98%, i.e. nearly all households. Households with a non-resident adult were a remarkable 88%. Households with a non resident child were 53%. Households with a male head constituted 72% and households with a resident head, 68% [59].

The changes described by Posel and the high levels of female migration (thirty percent of the adult female population) described by Hosegood are not surprising considering the historical context of South African black population. This includes such factors such as the subordinated role of women in rural society, a history of gender imbalance in terms of access to urban opportunities, an increase in the proportion of female headed households, scarcity of land and employment opportunities in rural areas, better economic opportunities in urban areas, and the rise of political freedom in the 1990's.

This section uses Agincourt Health and Demographic Surveillance System data to provide a descriptive picture of temporary migrant women, as a prelude to analysing the relationship between female temporary migration and child mortality. The primary focus is on employment status, marriage and fertility, destination and links with home.

5.2 Methods for this chapter

Data for the chapter are drawn from two sources: the Agincourt health and demographic surveillance system, described in chapter 2, and the temporary migration census module described in chapter 3. The surveillance system provided extra details of the individual attributes of the female temporary migrants including marital status and the number of living children. Key variables were divided into categories and presented for the two age groups, 15-34 and 35-54, i.e. young adults and older adults respectively. In the previous chapter it was shown that these age groups are the most prevalent for female temporary migration while at the same time they are most likely to be mothers of children.

The destinations of temporary migrants were recorded as a text field in the temporary migration census module. These were then coded into the categories that best summarized the data. For 'Patterns of home return' the variable was pre-coded based on the results of a pilot study conducted in the 2000 census. An option of 'other, specify' was provided for when the explanation could not fit the coding system. Fieldworkers could also choose more than one code to describe the patterns of return. The resulting data was recoded into descriptive categories that provided an appropriate summary.

5.3 Key Findings

5.3.1 Employment status of adult female temporary migrants

It has been assumed in migration literature that men are the main participants in labour migration while women migrate mostly for marriage reasons or to accompany males [48]. The employment status of the Agincourt adult female temporary migrants is given in

table 1. It can be seen that 60% of migrant women were employed, 5% looking for work and 15% involved in school, college or university studies. The 20% of migrants who were not working were mainly moving to live with a migrant spouse or to stay with parents in the destination household. The older adult age group were proportionally twice as likely to be employed, but there were double the number of younger adult migrants and a quarter of these were involved in schooling or studies.

	Age group: 15-34	Column %	Age group: 35-54	column %	Total	column %
Working	1003	48%	1004	80%	2007	60%
Looking for work	142	7%	25	2%	167	5%
School/study	497	24%	6	0%	503	15%
Not looking for work	463	22%	217	17%	680	20%
Total	2105	100%	1252	100%	3357	100%

Table 7: Employment status of adult female temporary migrants, by age groups 15-34 and 35-54 years, 2002

5.3.2 Type of work of adult female temporary migrants

It was seen in table 1 that 60% of adult female temporary migrants were employed. In figure 1 it can be seen that these women worked in a range of occupations, mostly however at the lower end of the labour market spectrum in terms of wages and occupational status. The main employment for younger and older adult migrants was on commercial farms. Employment as a domestic worker was also a primary reason for female temporary migration. Older adult migrants were more likely to be small business owners, usually in the informal sector, and also engaged in cleaning work in a range of sectors. Younger adult migrants were more likely to be an assistant in small businesses. Table 2 summarises the data by occupational sectors. Only 14% of all female migrants were involved in skilled, formal sector work, like teaching, nursing, or an administrative position. Over 62% of women found their employment in the informal sector, the largest

proportion of which (over 50% of all employed women) was informal, unskilled work. This ranged from employment as a farm labourer, to petrol attendant, domestic worker, cleaning lady or informal retailer, particularly trading in fruit, locally grown vegetables or inexpensive clothing.

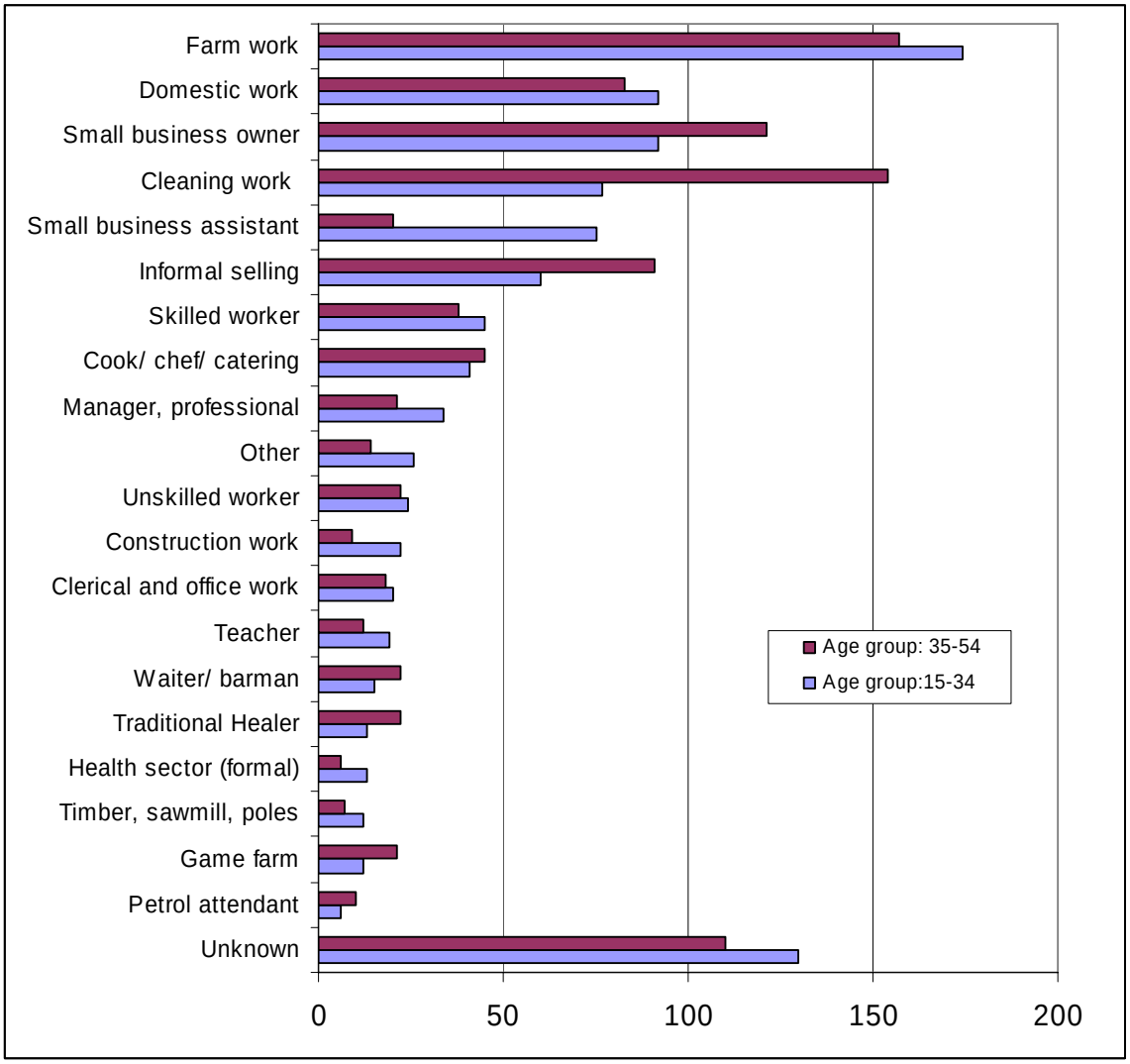


Figure 8: Type of work of employed temporary migrant women, by age groups 15-34 and 35-54 years, 2002

	Age group: 15-34	column %	Age group: 35-54	Column %	Total	column %
Unskilled formal	135	13%	97	10%	232	12%
Unskilled informal	525	52%	485	48%	1010	50%
Skilled formal	108	11%	169	17%	277	14%
Skilled informal	105	10%	143	14%	248	12%
Unknown	130	13%	110	11%	240	12%
Total	1003	100%	1004	100%	2007	100%

Table 8: Occupation and employment sector by age group of employed female temporary migrants, 2002

5.3.3 Marital Status of adult female temporary migrants

It was mentioned above that Posel and Casale [44] attribute increasing female temporary migration to changing trends in marital status. Both political and domestic pressures have compelled women to remain at home. While the political pressures were relieved in 1986 there was still a strong patriarchal tradition by which African women were expected to remain in the rural home. The age of marriage however is getting older and more women are entering the labour market [44]. Table 3 gives the marital status of the Agincourt adult female temporary migrants in 2002. More than a half of the women were unmarried, and these were primarily in the 15-34 year age group. A quarter of all female migrants were married, while just under another quarter were separated, divorced or widowed.

	Age group: 15-34	column %	Age group: 35-54	column %	Total	column %
Never married	1458	69%	263	21%	1721	51%
Married	428	20%	410	33%	838	25%
Divorced	157	7%	349	28%	506	15%
Separated	37	2%	71	6%	108	3%
Widowed	25	1%	159	13%	184	5%
Total	2105	100%	1252	100%	3357	100%

Table 9: Marital status of female labour migrants, by age groups 15-34 and 35-54 years, 2002.

5.3.4 Number of living children of adult female temporary migrants

It was mentioned in the introduction that a high level of premarital fertility exists in the population. The analytic question that will be engaged in the next chapter concerns whether temporary migration of mothers adds to the risk of child mortality. In this section we examine whether adult female temporary migrants were mothers in 2002.

It can be seen that the majority, 57%, of adult migrants did not have a living child. Proportionally, the age group most likely to have no children was the 35-54 year old female migrants. There were however 30% of female temporary migration having one living child, 10% who had two children and 3% with three or more children.

	Age group: 15-34	column %	Age group: 35-54	column %	Total	column %
No living children	1095	52%	803	64%	1898	57%
One living child	718	34%	283	23%	1001	30%
Two living children	229	11%	114	9%	343	10%
Three or more living children	63	3%	52	4%	115	3%
Total	2105	100%	1252	100%	3357	100%

Table 10: Number of living children of temporary migrant woman, by age groups 15-34 and 35-54 years, 2002

5.3.5 Destinations of female temporary migrants

The next four sections address aspects of connection between temporary migrant women and their rural homes. This section looks at the destination of female migrants to give a measure of how far people move as temporary migrants. The answer is that people moved far. Relatively few, only 11%, migrated short distances to a town or village within the same district. 23% moved to commercial farms within the same province, which tied in with the main reason for female temporary migration shown in section 5.3.2. Migration to a town within the same or adjacent province made up another quarter of the migrant destinations. The largest category of destination however was to the primary national metropolis of Gauteng making up 44% of all migrant destinations. These destinations included Johannesburg, Pretoria and Vereenging which are metropolitan areas situated about 500 kilometres from the study site. See Appendix 1 for maps to provide a spatial orientation.

	Age group: 15-34	column %	Age group: 35-54	column %	Total	Column %
A town or village in the same district	224	11%	142	11%	366	11%
Same province formal agriculture	398	19%	381	31%	779	23%
Same province secondary urban	252	12%	171	14%	423	13%
Other province secondary urban	195	9%	116	9%	311	9%
Primary metropolis	1039	49%	439	35%	1478	44%
Total	2108	100%	1249	100%	3357	100%

Table 11: Destination of temporary migrant women, by age groups 15-34 and 35-54 years, 2002

5.3.5 Duration of migration for female temporary migrants

This section examines the duration of temporary migration, or the length of time that women have been migrating. While a quarter of the adult female migrants started to migrate less than two years ago, 40% had been migrating for two to four years, and another quarter for five to ten years. Ten percent of adult female migrants had been migrating for more than eleven years.

	Age group: 15-34	column %	Age group: 35-54	column %	Total	Column %
0-1 years	636	30%	163	13%	799	24%
2-4 years	1027	49%	304	24%	1331	40%
5-10 years	413	20%	485	39%	898	27%
11-20 years	32	2%	268	21%	300	9%
>20 years	0	0%	29	2%	29	1%
Total	2108	100%	1249	100%	3357	100%

Table 12: Duration of female temporary migration by age groups 15-34 and 35-54 years, 2002

5.3.6 Patterns of returning home for female temporary migrants

Literature describing the causes of healthy children usually focuses on the characteristics of the mother (e.g. education, parity, birth interval), and her environment (e.g. socio-economic condition, access to health care, etc.). The importance of mothers is usually ascribed to elements of her devoted skill, the time she has to spend on the child's needs, and her own health [28, 60, 61]. It follows that if a mother's absence through temporary migration is deleterious to the health of a child then the extent of the absence and frequency of return should be important moderating elements. This section examines patterns of home return for adult female temporary migrants. Only a small proportion, 4%, returned very seldom, and this is usually at Christmas. Forty percent of migrants returned 'little, but regularly'. The key patterns in this category were returning at Christmas and Easter breaks, or month-end weekends, or one or two of the school holidays. The 'frequent return' category had a low occurrence and was characterized by returning most weekends or month-end weekends plus school holidays. An irregular pattern occurred most frequently, and depended on employment conditions. The data show that although temporary migration is defined as an absence of at least half of a year, the pattern of return is highly variable.

	Age group: 15-34	column %	Age group: 35-54	column %	Total	Column %
Almost none	90	4%	55	4%	145	4%
Little, but regular	891	42%	440	35%	1331	40%
Frequent	108	5%	115	9%	223	7%
Irregular	986	47%	622	50%	1608	48%
Unknown	30	1%	20	2%	50	1%
Total	2105	100%	1252	100%	3357	100%

Table 13: Patterns of home return of female temporary migrants, by age groups 15-34 and 35-54 years, 2002

5.3.6 Time since last communication for female temporary migrants

Another index of connection between the migrant and her rural home is the frequency of communication. This is estimated here by categorising the time since last communication, defined as contact by telephone. In a large majority (60%) of female migrants communication occurred with two weeks of the census interview. Eighty four percent of all female migrants had communicated within three months of the census interview, and only ten percent had a duration of non-communication greater than six months. These findings reinforce the definition of temporary migrant, as opposed to a permanent out-migrant, that a person leaves the household but stays in touch and remains a de jure household member.

	Age group: 15-34	column %	Age group: 35-54	column %	Total	Column %
Less than 2weeks	1213	58%	799	64%	2012	60%
2-4weeks	222	11%	161	13%	383	11%
1-3months	305	14%	132	11%	437	13%
4-6months	128	6%	55	4%	183	5%
Greater than 6months	240	11%	102	8%	342	10%
Total	2108	100%	1249	100%	3357	100%

Table 14: Time since last telephone communication of female temporary migrants, 2002

5.4 A discussion on female temporary labour migration and the possible implication for children

The norms governing a women's role in rural society and the opportunities for engaging in the labour force have been strongly conditioned by gender. Firstly, there has been an overwhelming tradition of male dominance in traditional authority and domestic matters in rural South African culture [62]. Until recently, women have had almost no rights to own or access land and encountered severe problems obtaining the resources necessary to engage in production. Women also typically had little power in their families to make decisions over such issues as how to spend income and when to migrate [63]. In Apartheid times if black women were able to enter the labour force, conditions were stacked strongly against them. In 1979 the starting salary for a black nurse in the public sector was two thirds of that of a white nurse of equal qualification [24]. An analysis of

wages based on SALDRU[5] data in 1993 showed that black women earned way below any other race/ gender category, with and average hourly wage of R3.30 compared to black men who received an average of R4.80, coloured women R5.10 and white women R15.80 [64].

Nevertheless, there has been a growing emergence of female-headed households, both de facto and de jure, in Southern Africa [65]. This has accompanied broader societal changes and implies the emergence of new gender roles. In the Agincourt data, the de jure proportion of female-headed households increased from 29% in 1992 to 33% in 2000 (chi-squared statistic = 83.8; degrees of freedom = 8; p-value = 0.000) [66]. Usually the status of household head is accompanied by the need to ensure adequate income for the household; hence an increasing proportion of female headed households should in itself imply more women in the work-force.

The data presented in this section showed that rural African women are definitely migrating to destinations far from home with the aim of employment and schooling. The profile of temporary migrant women varies, ranging from young, unmarried women doing clerical work in Johannesburg, to older married or divorced women working on commercial forms, or as domestic workers, to a whole range of destinations and job types (usually in the informal sector). Women may or may not have children, but if they do the children are very likely to remain in the custody of a parent, sibling or other close family member when they migrate. It was shown in the previous chapter (section 4.3) that only 7% of temporary migrations involved a child accompanying a parent. We have seen

[5] Southern African Labour and Development Unit, University of Cape Town.

evidence of relatively frequent communication between migrants and their families, however the fact remains that families are disunited and that the trend is growing. The question of whether this scenario impacts on child mortality is as yet unanswered.

Data from the 1995 October household survey showed that in South Africa roughly 20% of black children aged 0-18 lived apart from their biological mother as a result of migrant labour [67]. Case went on to analyse the data from the 1995 South African Income and Expenditure Survey, and found that holding a range of factors constant (number of children of different age groups, overall household size and age composition, age, gender and nationality of household head, completed education among household members, and total household income), overall spending on food increased on average by about 2% if a biological child aged 0-5 were to replace a non-biological child in the same age group [67]. The extra food items bought were mainly dairy products (milk, cheese, eggs), but there was also an increase in fruit and nuts, jam and sugar, and vegetables. This effect however fell away if the mother was neither head of the household nor spouse of the head, since then it was very unlikely that she controlled the household budget when it came to buying food. This, argues Case, provides evidence that biological mothers tend to protect their own offspring more than other children during the child's most vulnerable years. The finding also suggests that the absence of a biological mother may have detrimental health effects on her children.

A study in Senegal found that rural-urban migration by Senegalese women increased the survival probabilities of their 16-59 months old children [68]. The researcher attributed this mainly to urban-rural differentials in the availability of health services. A South

American study showed similarly that the survival probability of children born to rural migrant mothers in Peru and Bolivia was higher than for children born to rural non-migrants, but lower than that of children born to urban natives [69]. A study in Uganda analysed different migrant streams to explore association with child survival [70]. They concluded that migration is only weakly related to child survival and has the strongest (positive) impact for urban-to-urban migrant children. These studies focus on the classic definition of migration as a definitive move, which implies that a mother's children accompany her, and that the household is unlikely to return to its place of origin.

In the Uganda study an interesting result appears which they do not explore, that when mother's occupation is put into a multi-variate model estimating child survival, her employment in a non-agricultural job significantly lowered the odds of child survival by 37% when compared with unemployed mothers. This is suggestive of a negative impact of a mother in the work- force that may be related to circular migration.

A study conducted at the Navrongo field-site in Ghana also looked at the relationship between migration and infant/ child mortality, while controlling for the sex of the child, age and education of the mothers, household socio-economic status and seasonality [71]. The researcher concluded that some urban exposure for a mother benefitted child survival, which he proposed is because the mother will be more likely to use modern health care facilities once she has been in the city. These mothers have conducted an urban to rural move, but we don't know how long they were in the city, nor whether their children remained in the rural area while they were away. The researcher suggests these

women leave husbands in the city and return to the rural area to deliver and raise their children with the support of their own mothers. Children of mothers who conduct rural-rural moves fared worse than children of non-migrant mothers. This he associated with the hardships of moving, and the possible selectivity of vulnerable households making these rural-to-rural moves, in particular women leaving marital homes to return to parental homes indicating relationship strain, possibly violence, and the overarching effect of poverty.

Thus, literature indicates that temporary migration of a mother could have a positive outcome through the mechanism of improved income and the diffusion of ideas, or it could have a negative outcome, associated with the absence of a mother's devoted care.

These effects will be influenced by the cultural setting, the mother's characteristics, like age, education, and reproductive history, position in the household, and the type of household she leaves behind, including its composition, size, and socio-economic situation.

Chapter 6

THE IMPACT OF FEMALE TEMPORARY MIGRATION ON CHILD MORTALITY

6.1 Introduction

Understanding the factors influencing child mortality has been a requirement of medical and social science for many decades. An article in 1936 provided a framework that incorporated a holistic approach to the problem. It argued that there are four categories of factors, namely political, social, sanitary and medical [72]. This recognition of social factors was a laudable step towards an understanding of the problem, however, because of their more diffuse nature far less is known about behavioral and social determinants of child mortality than about biological ones [61].

An influential model developed to understand social/ biological factor's interactive impact on child mortality was that of Mosley and Chen in 1984 [28]. This identified five groups of proximate determinants of child health: factors related to the mother (age, parity, birth interval); environmental contamination; nutrient deficiency; injury; and personal illness control. They asserted that each of these factors are influenced by socio-economic determinants, which included (1) individual level variables (individual's productivity, as measured by education and occupation; and traditions, norms and attitudes); (2) household level variables (income, wealth); and (3) community level variables (ecological setting, political economy, health system). This framework implies that variation in mortality between households within a given community (where households are subject to the same community-level conditions and influenced by the

same culture) can be explained by differentials in socio-economic factors such as education, occupation, income and wealth.

A range of authors have emphasized different social variables as more important in different settings. Caldwell, studying infant and child mortality in West Africa, noted that maternal education explained more variance in child mortality than all other socio-economic measures [60]. Das Gupta argued that in rural Punjab, several biological and socio-economic factors influenced child mortality, but there is a residual variation that persists when these factors are accounted for. She identified a tendency for child deaths to cluster within families, even after controlling for these social and biological factors [61, 73]. She posited that this clustering of deaths can be explained by the basic abilities and personality characteristics of the mother, independently of education, occupation, income and wealth. While the Mosley and Chen model included maternal characteristics, and Caldwell underlined education amongst these, Das Gupta helps us realize that many things affect the skill and capabilities of a mother, and that inherent capabilities are far from uniform.

The utilisation of health services can have a key effect on infant mortality, either directly or indirectly. The direct effect is either to improve preventative behaviour, through enhancing knowledge, attitudes and skills, for example through attendance of antenatal clinics or well-baby clinics, or through direct medical intervention in the case of child illness. But, more important perhaps may be the indirect effect that utilisation of health services is an indicator of all round competence in childcare. It requires sufficient care and aptitude to recognize symptoms of ill-health and act on them, and to be motivated to

incorporate preventative measures into daily life. These can indicate a propensity to other beneficial behaviors of caregivers such as cleanliness, self-discipline, etc. Health service utilisation is strongly influenced by maternal education [60], as well as community level factors, particularly access to services [74], quality of care [74] and transport availability [75]. It is also strongly correlated with socio-economic status [60, 75].

Several biological factors are well known to influence infant mortality. Parity is closely associated with maternal age and has a U-shaped relationship to infant mortality: the risks appear highest among very young and older mothers at the first and highest parities [76, 77]. The affect of increased risk through high parity can be associated with factors such as maternal age, birth interval and socio-economic status [78]. Birth interval can influence the risk of infant mortality through the depletion of the mother's physical resources, if the interval between births is low, as well as sibling competition for care and nutrition [79, 80]. Breastfeeding may have a direct effect on infant survival associated with the all round nutritional, hygienic and immunity benefits, as well as the indirect benefit of contributing positively to birth spacing [81-83].

High levels of adult female temporary migration suggest we should modify the model to include the effects of characteristics of other child-rearing adults, possibly also the mother's sister, mother, mother-in-law or older daughter, who may be responsible for the child while the mother is away. In traditional societies, a sharp division of labour by sex tends to maximize the mother's time for childcare, but in transitional societies (such as the Agincourt sub-district population) childcare often competes with time needed for income generating work [84, 85]. The consequences of a mother's work for infant health

depend largely on the circumstances of the household and the human childcare resources available to the mother. Some writers suggest that in poor, or otherwise vulnerable families, a mother's work outside the household may result in child neglect or care by a less skilled or inattentive individual [28]. When the mother is absent for most of the year, as is the case with the temporary migrant mothers, these effects could emerge as an influence on infant mortality. A key question then becomes: are children of migrant mothers exposed to higher mortality risks that can be associated with the absence of the adequate child care?

To explore the hypothesis that a mother's prolonged absence could influence infant and child mortality, either positively through improved income, or negatively through attenuating the well described mother effects, this dissertation presents a survival analysis undertaken on a cohort of children. The outcome of interest is the death of a child aged under five years. The analysis incorporates the key elements described by Mosley and Chen and includes the variable "mother's migration status in the child's early years ".

6.2 Study Design

The following null hypothesis is investigated in the analysis:

'The prolonged absence of an increasing number of mothers does not influence the infant and child mortality in the setting of rural Limpopo Province, South Africa'

It is a two-way test. One alternative hypothesis is that there could be a positive influence through improved income, exposure or skills development in the women involved. Another alternative hypothesis is that there could be a negative influence through family disruption, which attenuates the well described benefits of mothers residing with their children.

To examine these hypotheses a survival analysis was conducted on an open cohort of children and their mothers, using the Agincourt health and demographic surveillance data. The cohort was followed up from 01/01/92 to 31/10/00 and included all children who spent time in the sub-district during that period, and their mothers. Entry into the cohort was captured by entry to the HDSS (through birth, in-migration or presence in the baseline census), and exit from the cohort determined either by departure from the HDSS before age 5 years (through death or out-migration), turning five years during the follow-up period, or reaching the end of the follow-up period before turning five. In total 30,633 children were included in the cohort analysis contributing a total of 81,017 person years of follow-up (see Table 15). The total number of cohort mothers was 16707.

6.3 Analytic Approach

Based on the open cohort survival analysis[6] was employed which allowed us to account for different levels of risk occurring at different ages of children. Kaplan Meier curves[7] were used to describe the survival of children in the cohort, and true mortality rates were calculated as deaths per person years at risk.

The longitudinal nature of the data was used to investigate the contribution of critical social variables (including various maternal and household characteristics) affecting childhood mortality. Cox regression[8] was applied, but it was assessed that for many factors it was not possible to assume proportionality of hazards over the five-year period of observation. Therefore, Poisson regression[9] was used to estimate the relative effects of various risk factors, including mother's migration. The statistical process involved

[6] Survival analysis is a longitudinal study design in which individuals are followed from the time they experience a particular exposure to the occurrence of a disease or death (see Glossary of Technical Terms p.xx).

[7] The Kaplan Meier curve displays the probability of survival as a function of time. This method calculates the estimated survival probability at time, t, by considering the risk sets of individuals still being studied at each time, t, at which a death event occurs (see Glossary of Technical Terms p.xviii).

[8] Cox regression is a 'proportional hazards' model for estimating the effects of different exposure variables. At the time of each event, the values of the exposure variables for the subject who experienced the death event are compared to the values of the exposure variables for all subjects still being followed and who did not experience a death. The model assumes the hazard ratio (relative risk), comparing exposed and unexposed subjects, remains constant over time (see Glossary of Technical Terms p.xiv).

[9] Poisson regression allows the estimation of rate ratios (comparing exposed and unexposed groups) by defining the log rate as a function of the exposure variables. This method is recommended when the proportional hazards ratio changes over time(see Glossary of Technical Terms p.xx).

comparing risk of death in different categories of variables using incidence rate ratios. This assessment was done over three age periods: the first year of life, ages one to four, and all children under five.

6.3.1 Analytic framework

A causal framework, based on the Henry Mosley – Lincoln Chen model, was proposed for the operation of social factors on child mortality (Figure 9 on page 74). The framework describes maternal presence variables (mother's migration status; mother living or not) as "over arching" effects, which are potentially mediated by the "pathway" variables (household nationality, gender of household head, number of co-resident children, mother's marital status, mother's age and mother's education level) lower down the causal hierarchy. This framework enables evaluation of the hypothesis that maternal presence affects childhood mortality though a demonstrable mechanism. The evaluation involved including the maternal presence variables in the regression model first, then adding risk factors that are lower in the framework to the model, and examining the results for significant change in the incidence rate ratio associated with a maternal presence variable. A resultant change would imply the mediation of the maternal presence effect by the pathway variable. Various household and other maternal characteristics were included as potential mediating variables. The results are reported as incidence rate ratios, with 95% confidence intervals.

All analyses were conducted using the survival time and Poisson regression commands in STATA version 7 [86]. Since some exposure variables are measured at the level of the

household, all confidence intervals have been adjusted to reflect this design effect by using STATA's *svy*[10] commands and setting the primary sampling unit to the household.

6.3.2 Variables used in the survival analysis

Exposure variables were constructed from the health and demographic surveillance system data described in chapters 2 and 3. The main variable of interest was the migration status of the mother. The variable "mother alive" was included as another indicator of maternal presence. Other variables used were carefully selected as potential mediators on the causal pathway or potential confounding variables (for example gender of household head, mother's age or age of child)

Table 16 describes the exposure variables used in this analysis. A number of the variables could theoretically change over time, although the potential importance of this varies from variable to variable. All time-changing exposure variables have been fixed at a point in time, usually either the time of entry to the cohort study or the census following the entry of the child to the cohort. The exception to this is the educational status of the mother, which has been recorded at different times during the census period. There are missing data for variables that reflect maternal characteristics, since the ability to match a child to his/her mother's characteristics is not complete in earlier census periods (covering the years 1992 - 1997).

To recap, the variables of mother's migration status and whether or not the mother is living are the key variables investigated in the analysis, with other variables tested as

[10] 'svypois' is a STATA command that estimates the Poisson regression for complex survey data.

mediators or confounders of this relationship. Two variables used to reflect general socio-economic status, or vulnerability, are gender and nationality of the household head.

6.3.2.1 Gender of household head

Migration theory holds that migrants are 'favourably self-selected' [87]. This implies that migration tends to be led by people with higher social resources like education, than the average population. A series of studies have shown that migrants tend to have higher levels of education than non-migrants and are able to earn higher wages at the place of origin compared to non-movers [88]. This is usually explained in terms of motivation to move and ability to meet the costs of migration. It does not necessarily follow that South African internal migration selects favourably for education and/or earning potential. Not only are the costs of migration fairly low, e.g. between Agincourt and Johannesburg, and social networks in the city often well developed, but poverty and lack of opportunity in the rural areas related to a history of underdevelopment has produced a strong incentive for people with low means to seek work in the towns and cities. Nevertheless, measures of socio-economic situation are included in the analysis, as well as the education status of mothers. Gender of the household head has been reported as an indicator of household socio economic status in rural South Africa [89]. This is primarily due to the lower earning capacity of rural women.

In the Health and Demographic Surveillance System the household head is recorded as the person recognized by the senior household members as the head. Headship is derived from a composite of resource contribution and decision-making, and fieldworkers are trained to probe carefully when establishing the holder of this position.

6.3.2.2 Nationality of household head

It has been reported that Mozambicans in the study site have lower quality of housing, less access to public services, including water, education, pensions, health services, roads, etc. They may also be subject to social discrimination by South Africans and endure mixed legal status [31]. These combine, in this setting, to make nationality of household head an indicator of social deprivation. It is assumed that the nationality of the household head will be a good marker of the nationality of the household.

6.3.2.3 Age of mother

The age of a child's mother has been suggested as exerting a U-shaped curve of effect on childhood mortality with younger and older mothers at risk of giving birth to more vulnerable children [77, 90-92] . In addition to any biological effect of age, in this setting it is important also to consider that young mothers may be less likely to be married, more likely to be in school, and more vulnerable to HIV infection. Older mothers may have higher risks of birth defects.

6.3.2.4 Mother's education

Maternal education may increase the propensity to migrate as well as influence child mortality [60, 76]. It can thus act as a confounder (through its own well-documented impact on health and mortality of a child) or as a pathway variable. Problems may exist in this measure, particularly in young mothers, for whom the measure of education may not be that prevailing at birth of the child.

6.3.2.5 Marital status

Elsewhere, a mother's marital status is reported as positively or negatively affecting child's access to health care in different situations [91, 93]. Thus, marital status is potentially important either as a mediator on the causal pathway between migration status and child mortality, or as a confounder of the relationship through it's own potentially independent effects. We fix the variable at the time of first interview of the mother after the birth of the child or migration into the cohort. This is a limitation because a change in marital status may occur after our measurement, potentially altering the child's mortality risk before it has exited the cohort. However, the highest risk of mortality occurs in the first year of life, which the variable represents most reliably.

6.3.2.6 Number of co-resident children

The number of co-resident children acts as a proxy for competition for resources, support and affection in the child's household. The variable includes all co-resident children who are aged five years or younger at the time of cohort entry of the index child. Child mortality literature highlights birth order as a risk factor [92, 94]. This variable addresses more directly the component dealing with resource competition within households. Later born children have a higher chance of having higher numbers of other children in the household. Both variables are related to household size, which may act differently in affecting childhood mortality. A large household may increase competition for resources, but on the other hand, if the household contains several adults, there may be more resilience in times of poverty due to more potential income streams and higher availability of child care support.

		Mode of Leaving the Cohort				
		Death during observat-ion period	Attained 5 years of age during observat-ion period	Out migrated during observat-ion period	Present in sub-district at end of observation	TOTAL
Mode of entering the cohort study	New birth during HDSS observation	495 (3%)	4657 (31%)	3365 (22%)	6661 (44%)	15178 (100%)
	Present in sub-district at start of observation	62 (1%)	9511 (85%)	1638 (15%)	0 (0%)	11211 (100%)
	In-migration during HDSS observation	21 (0%)	2508 (59%)	615 (14%)	1100 (26%)	4244 (100%)
	TOTAL	578 (2%)	16676 (54%)	5618 (18%)	7761 (25%)	30633 (100%)

Table 15: Entry and exit to open cohort of children aged 0-5 yrs, total size = 30633 children

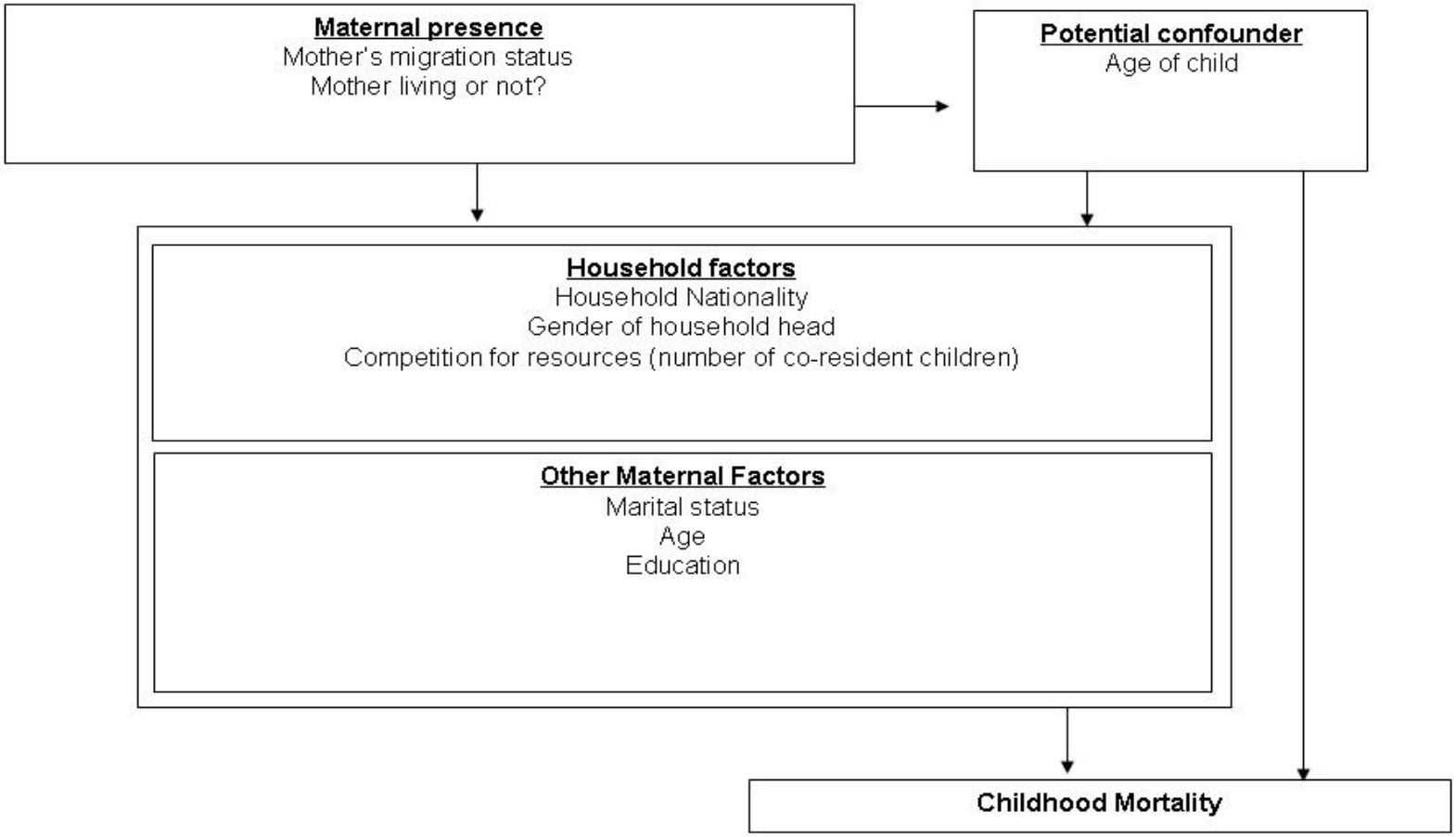


Figure 9: Hierarchical framework for analyzing the impact of maternal presence on childhood mortality (from Mosley and Chen, 1984 [28])

Variable	Likelihood of change over time	Time point variable measured at	Data on *n* cases	Additional Comments
Mother's migrant status after child's birth	Low	Census after cohort entry	30633	Age of child at which data is reflected differs from child to child
Mother's death status after child's birth	Low	Census after cohort entry	30633	Age of child at which data is reflected differs from child to child
Gender of HH head	High	Cohort entry	30633	-
Nationality of HH head	Low	Cohort entry	30362	-
Age of mother at child's birth	None	Birth	30633	-
Educational status of mother	High (young mothers) Low (older mothers)	Mothers Interview	26047	This variable was obtained in interviews in 1992, 1997 and for all in-migrants since then.
Marital status of mother	High	Census after cohort entry	22986	Age of child at which data is reflected differs from child to child
Number of other children in the home	High	Cohort entry	30633	-

Table 16: Exposure variables used in the survival analysis

6.4 Survival Analysis Results

6.4.1 Overall Childhood Mortality

There were 578 deaths in children under 5 over the observation period 01/01/92 – 31/10/00. The Infant Mortality Rate for the population was 18,7 deaths per 1000 live births, whereas the true mortality rate of children ages 0-1 years, computed as a rate of deaths to children aged 0-1 years per thousand years at risk was 18,2 deaths per 1000 person years at risk[11]. The Under 5 Child Mortality Rate was 35.7 per 1,000 person years at risk.

Table 15 shows the distribution of events leading to entry and exit from the cohort. The mortality rate is much higher among those who were born into the cohort than among those who were either present in the sub-district at the start of the observation period or migrated into the sub-district. This primarily reflects the fact that mortality is highest among the youngest children. This is also illustrated in Figure 10, which shows the Kaplan Meier survival function for the full cohort and gives age specific mortality rates. Characteristically, mortality is greatest immediately following birth and decreases rapidly but beginning to plateau around age 4. The age-specific mortality rate falls by roughly 50 percent year on year up to age 5 years. 96.4 percent of children born into this population survive to their fifth birthday.

[11] This Infant Mortality Rate may be low due to an undercount of neonatal deaths in the early years of demographic surveillance (1992-1997). This measurement error was improved in later years (1998 onwards) through recording the name of each women's last-born child on the census form and using this name as a prompt to establish the existence of any pregnancies in the intervening period, thereby revealing neonatal deaths that may otherwise have been

6.4.2 Risk factors for childhood mortality

Table 17, on page 86, provides details of the risk factors for childhood mortality under investigation in this study. This is a univariate analysis which provides the mortality rate for each category of risk factor, and the incidence rate ratios between risk factor categories, for ages 0-5, 0-1 and 1-5 years old. The reference category for each risk factor, against which the other categories are compared, is displayed with an incidence rate ratio of 1.

The maternal presence variables are associated to differing extents with childhood mortality. Children whose mothers were migrant during the year after their birth generally enjoyed a slightly improved survival profile (IRR: 0.71 (0.50-1.00))[12]. If the confidence interval excludes 1 this would indicate a statistically significant difference in the mortality rates associated with the different categories of the risk factor. It can be seen that the survival benefit associated with a mother's migration is almost, but not quite, significant at the 95% level.

The death of a mother during the period between cohort entry and the next census was strongly predictive of the child's mortality status (IRR: 3.27(2.16-4.96)). The effect was particularly strong during the infancy period, but was also seen during the period from the 1st to the 5th birthday.

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missed. Since there is no reason to assume that more neonatal deaths were missed if the mother was a migrant this undercount in the early years of surveillance should not bias the results obtained in the chapter.

[12] IRR: Incidence rate ratio; 95% confidence intervals given in brackets.

There was a limited impact on childhood mortality from living in a female-headed household, particularly during the infancy period (IRR: 1.25 (0.97 – 1.63)), although this did not reach statistical significance. However, children who came from Mozambican households are seen to have a significantly worse mortality profile than their South African counterparts (IRR: 1.41 (1.19 – 1.68)). On further investigation we see that this risk is concentrated in the post-infant years (IRR: 1.89 (1.49 – 2.39)), with little effect on mortality seen during the first year of life (IRR: 0.98 (0.78 – 1.26)).

Children born to mothers aged 20-29 years, the commonest childbearing age, seem to have a survival advantage over children born to both older and younger mothers in the first year. However, children born to the oldest mothers who survive this first year exhibit the lowest mortality rates during the next 4 years (IRR: 0.58 (0.37 – 0.92)). While there is surprisingly little variation in mortality rates between children born to mothers with either no schooling or some formal schooling, it does seem that children born to the small group of mothers who go on to post-school education have much improved survival chances (IRR: 0.35 (0.14 – 0.86)).

Children born to unmarried mothers were at substantially greater risk than children born to married (IRR: 0.61 (0.49 – 0.75)) or divorced/widowed women (IRR: 0.71 (0.51 – 0.99)). Additionally, Children coming from families with many co-resident children (3 or more) were at greater mortality risk than children with no other co-resident children, particularly in the age group 1 – 5 years (IRR: 1.68 (1.18 -2.39)).

Throughout the table it can be seen that the number of cases in each category is quite large due to the size of the population covered by the health and demographic surveillance system. This adds confidence in the relationships found in the analysis.

6.4.3 Multivariate analysis of factors associated with child mortality

In this section the multivariate analysis is reported, in which alternative models were explored, based on the framework provided in figure 9 and explained in section 6.3. A sequence of statistical models are portrayed which explore the *combined* effects of the various risk factors together with the mother's migration status. The aim is to understand which factors have the strongest effects when working in conjunction with other factors. Finally, a comprehensive model is reached with the highest explanatory power.

6.4.3.1 Mother's death

The death of a mother impacts strongly on the likelihood of her child dying (IRR: 3.10 (2.04 - 4.72)). This can be seen in Table 18. One explanation is that maternal orphans experience a significantly less protective and nurturing environment. Also, mothers who are HIV positive may have transmitted the virus to their child through maternal-to-child placental transmission. There is no further systematic investigation undertaken to try to understand what mediates this impact. The study design is limited with respect to this question, because a pre-requisite when investigating most of the risk factors in the study is that the mother remains alive.

6.4.3.2 Mother's temporary migration

Table 19 shows that children whose mothers were migrant during the year after their birth generally enjoyed a slightly improved survival profile (IRR: 0.76 (0.54 - 1.08)), although this did not reach statistical significance. To understand how this effect operates with reference to other factors we include mother's migration status together with the other factors in multivariate models.

6.4.3.3 Marital status

If a mother has never been married her children experience a significantly higher risk of mortality when compared with married mothers (IRR: 1.59 (1.27 - 1.99)). When accounting for the mother's marital status the effect of migration status on mortality is completely removed (see Table 20). Employing the logic of the causal framework (Figure 9) this implies that the slightly positive effect of migration may actually be a marital status effect. It is likely that migration status and marital status both have effects, but that these interact, with the stronger effect being that of marital status.

Table 21 shows a model that incorporates education status with marital status and migration status. Including education status increases the negative effect of being 'never married' on mothers' child mortality profiles. This indicates that, at least partly, education differentiates the risk among 'never married' mothers. One explanation of these results is that the 'never married' mothers, who are better educated, are more likely to migrate and have a more positive child mortality outcome, whereas less educated, 'never married' mothers have worse child mortality outcomes.

6.4.3.4 Education Status

When including “mother’s migration status” and “education status” in the same model the “education status” emerges as a strong protective factor at a level of post-matriculation education (IRR: 0.37 (0.15 - 0.92)). The marginally beneficial effect of migration seen on its own is completely overridden by education status. This implies that the apparent advantage of mother’s migration for child mortality is at least partly derived from the fact that more tertiary educated mothers are likely to migrate. This can be seen in Table 24.

6.4.3.5 Gender of household head

There is little evidence for a relationship between the gender of the household head and childhood mortality (Table 17). The mortality rate ratio associated with being born into a female-headed households is near 1.0 and is not statistically significant for children in either the first year of life or in the age range 1-5 years. A limited association is seen in the first year of life, with female-headed households showing slightly higher infant mortality, but this does not reach statistical significance.

When including marital status in the model with “gender of head” and “migration status” (see Table 22) we see that “marital status” remains strongly influential, but the “gender of head” and “migration status” lose their effects. This can be explained by the fact that proportionally more “never married” mothers live in female headed households, and the excess child mortality risk arises through their marital status rather than the gender of their household head. While female headed households make up 30% of all households in this population these households contain 50% of the ‘never married’ mothers.

6.4.3.6 Nationality of household head

The “nationality of household” head shows strong correlation with a higher mortality profile. This effect remains strong no matter which other factors are included in the model and does not seem to have an impact on the effects of other factors.

Table 23 shows a model that includes “nationality of head” and “migration status”. This demonstrates a strong and seemingly independent effect of Mozambican nationality conferring a high risk of child mortality (IRR: 1.47 (1.22 - 1.76)).

6.4.3.7 A Comprehensive model

Some of the factors investigated are highly interactive and tend to confuse the overall picture when they are put in the same model. In particular, education status interacts with nationality status and migration status. The optimal comprehensive model is given in Table 25. This has the most predictive power of all the multivariate models estimated, with an overall F-statistic of 7.15 and p-value of 0.000. The model shows the following factors are simultaneously associated with higher levels of child mortality: Mozambican “head of household”, never married “marital status” and “mother’s age” older than 40 years. Together, these factors effectively negate the apparent benefit of migration.

6.5 Summary of findings

Temporary migration of mothers in a child’s early years, much of which is employment-related and hence income generating, looks to be slightly protective (table 19), but this effect becomes muted when considering co-factors of education status and marital status (table 21). There are more post-matriculants among the migrants, which reflects as a

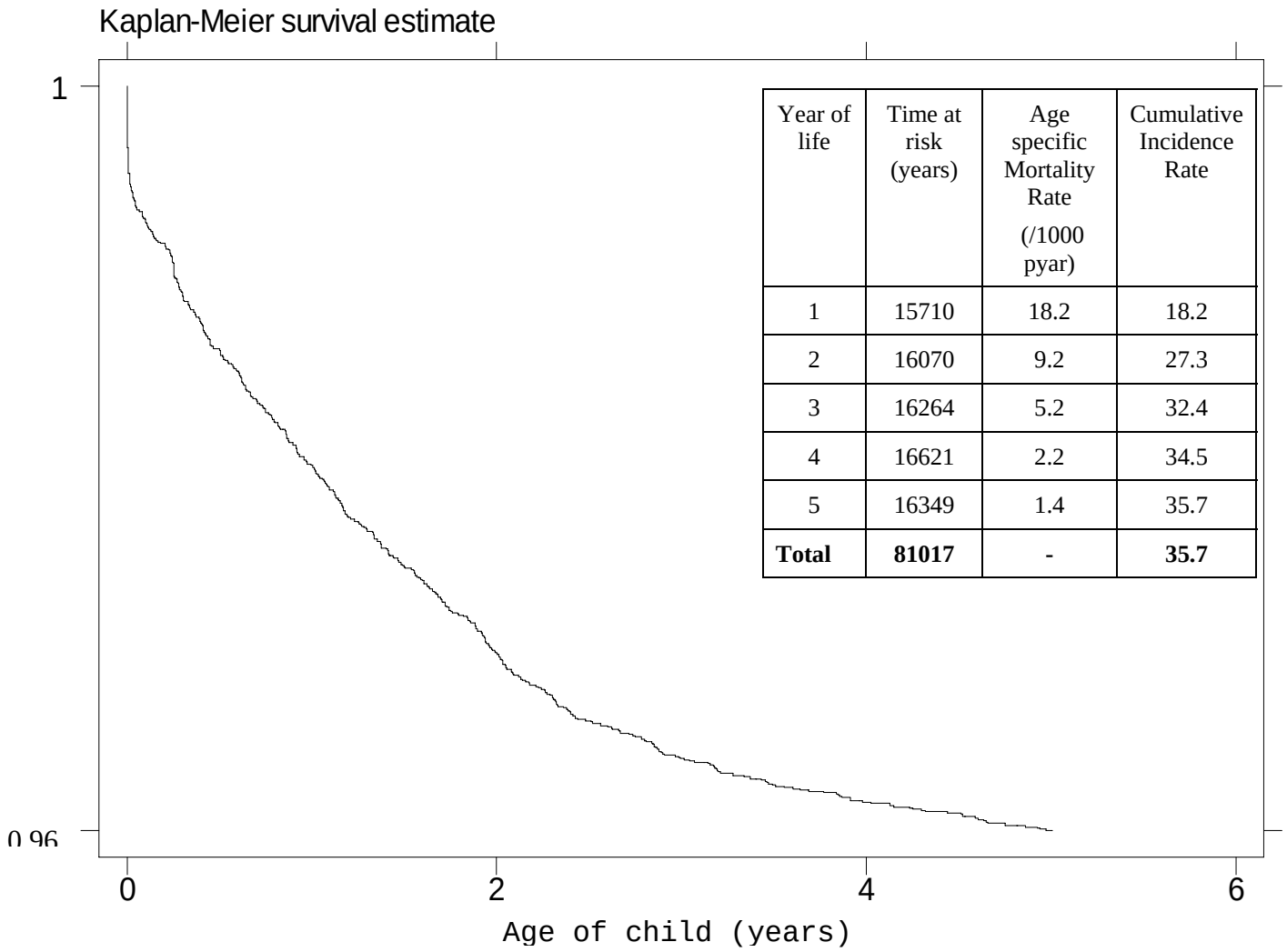
slight child mortality advantage to temporary migrant mothers. Migration positively self-selects for education level; as a result many temporary migrant woman would likely experience improved child survival even if they did not migrate.

A mother's death after a child's birth is unequivocally associated with a higher risk of child mortality (table 18). Similarly, there is a much stronger risk of child mortality in Mozambican households compared to South African, and this effect is independent of all other factors.

As noted, marital status is predictive of child mortality. When put into a model together with 'female headed households' this effect diminished the slightly negative effect of staying in a female-headed household. More "never married" mothers live in female-headed households and marital status shows up as a stronger effect in the model. The strong impact of marital status on child mortality may arise due to a married mother having more influence over how the household budget is spent, and better access to social resources. There is then also a father, which could exert a positive effect. These factors combine to lessen the child's mortality risk.

Mothers' age is important. Teenage mothers are a known risk category since they lack experience and resources [90, 95] and their children are shown to be at risk in this setting (Table 17). The multivariate analysis suggests that this age effect is driven by the fact that most teenage mothers have not married. The higher risk of mothers over age forty is maintained in all multivariate models and is not influenced by marital status. Importantly,

the mortality risk to children of older mothers is high for infants, but low for children aged 1 – 5 years.



Year of life	Time at risk (years)	Age specific Mortality Rate (/1000 pyar)	Cumulative Incidence Rate
1	15710	18.2	18.2
2	16070	9.2	27.3
3	16264	5.2	32.4
4	16621	2.2	34.5
5	16349	1.4	35.7
Total	**81017**	**-**	**35.7**

Figure 10. Survival function of children during the first five years of life, Agincourt, 1992 - 2000

Variable	Variable alternatives	Number of subjects	Person Years at Risk	Rate (/1000 PYAR)	IRR (95% CI) 0 - 5yrs	IRR (95% CI) 0 – 1yrs	IRR (95% CI) 1 – 5 yrs
Migrant status of mother	Permanent resident	26968	72464	6.6	1	1	1
	Temporary migrant	3179	7207	4.7	0.71 (0.50 – 1.00)	0.88 (0.52 – 1.49)	0.70 (0.44 – 1.11)
Death status of mother	Alive	30233	79671	6.9	1	1	1
	Dead	500	1249	21.6	3.27 (2.16 – 4.96)	6.96 (4.16 – 11.64)	1.68 (0.84 – 3.36)
Gender of HH head	Male	22821	61071	6.8	1	1	1
	Female	7904	19922	8	1.18 (0.97 – 1.42)	1.25 (0.97 – 1.63)	1.09 (0.83 – 1.43)
Nationality of HH head	South African	18944	50125	6.2	1	1	1
	Mozambican	11418	30430	8.6	1.41 (1.19 – 1.68)	0.98 (0.78 – 1.26)	1.89 (1.49 – 2.39)
Number of other children in the home	0	8639	21766	6.6	1	1	1
	1	11030	29450	6.6	1.00 (0.81 – 1.24)	0.92 (0.69 –1.24)	1.13 (0.82 – 1.56)
	2	5937	15855	7.3	1.11 (0.86 – 1.42)	0.91 (0.64 – 1.30)	1.37 (0.95 – 1.97)
	3 or more	5127	13945	8.8	1.33 (1.03 – 1.73)	1.13 (0.78 – 1.64)	1.68 (1.18 – 2.39)
Marital status of mother	Never married	6320	17910	9.2	1	1	1
	Married	13844	41227	5.6	0.61 (0.49 – 0.75)	0.64 (0.48 – 0.86)	0.70 (0.52 – 0.94)
	Widowed / divorced	2822	7318	6.6	0.71 (0.51 – 0.99)	0.66 (0.39 – 1.11)	0.94 (0.62 – 1.42)
Age of mother	12-19	5870	16628	8.1	1.20 (0.96 – 1.49)	1.25 (0.91 – 1.73)	1.09 (0.81 – 1.47)
	20-29	12719	34743	6.8	1	1	1
	30-39	6595	19472	6.5	0.96 (0.77 - 1.20)	1.00 (0.72 – 1.40)	0.93 (0.69 – 1.24)
	40 and over	5549	10174	7.8	1.16 (0.89 – 1.50)	1.68 (1.21 – 2.32)	0.58 (0.37 – 0.92)
Educational status of Mother	None	8253	22593	6.5	1	1	1
	Primary	7403	20532	6.9	1.06 (0.84 – 1.35)	1.03 (0.72 – 1.48)	1.00 (0.73 – 1.37)
	Secondary	9580	26188	7.4	1.14 (0.91 – 1.43)	1.20 (0.86 – 1.69)	0.96 (0.71 – 1.28)
	Post Matric	811	2178	2.3	0.35 (0.14 – 0.86)	0.29 (0.71 – 1.19)	0.37 (0.12 – 1.12)

Table 17: Univariate Poisson regression analysis on potential risk factors for childhood mortality

Risk Factor		IRR (CI 95%)	p-value	Overall F-statistic	Overall p-value
Mother died	No	1		27.89	0.0000
	Yes	3.10 (2.04 - 4.72)	***		

(***=p<0.01; **=p<0.05; *=p<0.1)

Table 18: Impact of mother's death on the risk of child death for children aged 0-5 years

Risk Factor		IRR (CI 95%)	p-value	Overall F-statistic	Overall p-value
Mother migrant	Permanent resident	1		2.35	0.1251
	Temporary migrant	0.76 (0.54 – 1.08)			

Table 19: Impact of mother's migration status on the risk of child death for children aged 0-5 years

Risk Factor		IRR (CI 95%)	p-value	Overall F-statistic	Overall p-value
Mother migrant	Permanent resident	1		5.65	0.0007
	Temporary migrant	1.04 (0.69 - 1.55)			
Marital status of mother	Never married	1.59 (1.27 - 1.99)	***		
	Currently married	1			
	Widowed / divorced	1.27 (0.91 - 1.76)			

(***=p<0.01; **=p<0.05; *=p<0.1)

Table 20: Impact of mother's migration and marital status on the risk of child death for children aged 0-5 years

Risk Factor		IRR (CI 95%)	p-value	Overall F-statistic	Overall p-value
Mother migrant	Permanent resident	1		3.52	0.0018
	Temporary migrant	1.15 (0.76 - 1.75)			
Marital status of mother	Never married	1.68 (1.29 - 2.18)	***		
	Currently married	1			
	Widowed / divorced	1.23 (0.87 - 1.75)			
Education of mother	no education	1			
	primary	0.74 (0.56 - 0.98)	**		
	secondary	0.82 (0.61 - 1.10)			
	Tertiary	0.32 (0.12 - 0.87)	**		

(***=p<0.01; **=p<0.05; *=p<0.1)

Table 21: Impact of mother's migration, marital status and education status on child death for children aged 0-5 years

Risk Factor		IRR (CI 95%)	p-value	Overall F-statistic	Overall p-value
Mother migrant	Permanent resident	1		4.27	0.0019
	Temporary migrant	1.03 (O.69 - 1.55)			
Gender of HH head	Male	1			
	Female	1.03 (0.80 - 1.33)			
Marital status of mother	Never married	1.58 (1.24- 2.01)	***		
	Currently married	1			
	Widowed / divorced	1.25 (0.88 - 1.78)			

(***=p<0.01; **=p<0.05; *=p<0.1)

Table 22: Impact of mother's migration, marital status and gender of household head on child death for children aged 0-5 years

Risk Factor		IRR (CI 95%)	p-value	Overall F-statistic	Overall p-value
Mother migrant	Permanent resident	1		9.4	0.0001
	Temporary migrant	0.81 (0.57 - 1.14)			
Nationality of HH head	South African	1			
	Mozambican	1.47 (1.22 - 1.76)	***		

(***=p<0.01; **=p<0.05; *=p<0.1)

Table 23: Impact of mother's migration and nationality of household head on child death for children aged 0-5 years

Risk Factor		IRR (CI 95%)	p-value	Overall F-statistic	Overall p-value
Mother migrant	Permanent resident	1		1.84	0.1178
	Temporary migrant	1.09 (0.75 - 1.59)			
Educational status of mother	None	1			
	Primary	0.95 (0.74 - 1.21)			
	Secondary	1.14 (0.89 - 1.46)			
	Post Matriculant	0.37 (0.15 - 0.92)	**		

(***=p<0.01; **=p<0.05; *=p<0.1)

Table 24: Impact of mother's migration and education status on child death for children aged 0-5 years

Risk Factor		IRR (CI 95%)	p-value	Overall F-statistic	Overall p-value
Mother migrant	Permanent	1			
	Migrant	1.04 (0.69 - 1.56)			
Nationality of HH head	South African	1			
	Mozambican	1.75 (1.42 - 2.16)	***		
Marital status of mother	Never married	2.11 (1.61 - 2.75)	***		
	Currently married	1		7.15	0.0000
	Widowed / divorced	1.28 (0.92 - 1.79)			
Age of mother	12-19	1.23 (0.92 - 1.65)			
	20-29	1			
	30-39	1.33 (0.94 - 1.87)			
	40 and over	1.61 (1.02 - 2.53)	**		

Number of co-resident children was tested, had no effect on the model, and hence omitted
(***=p<0.01; **=p<0.05; *=p<0.1)

Table 25: Impact of mother's migration, marital status, nationality of household head and age of mother on child death for children aged 0-5 years

6.6 Limitations in the survival analysis

6.6.1 Missing mother child link

In this chapter a cohort of children and their mothers was constructed to test hypotheses about the impact of maternal absence on child mortality and how this is influenced by characteristics of migrant mothers. There are some limits to the analyses imposed by the data available and the analytic methods used. Definitions of variables and limitations in the data are described in sections 6.3.2 and in Table 16. A primary limitation arises from a subset of cohort children for whom we cannot match a mother, comprising just under 6% of the children-mother combinations. These cases were ignored in regression estimations when variables describing mother's characteristics were examined, which may introduce bias in these estimations. The cases were removed from the denominator also, which

would create bias towards the null hypothesis, making it slightly harder to demonstrate an effect.

6.6.2 Handling factors changing over time

In addition, several exposure variables are fixed at the time of child's entry into the cohort, or the time of the following census update. Each variable was carefully constructed to provide the most accurate measure of risk at the greatest time of vulnerability. This method should capture the most important value, but smaller changes in risk that change over time may not be adequately represented. Fixing the variable in time produces a snap-shot measure for a process that impacts over a period of time. Factors that change over the first five years of a child's life include mother's marital status, mother's age, household composition and residence dynamics, and the household socio-economic situation. Furthermore, the time at which the variable is fixed is a birth event in only half of the observations (50%); for the others it is an in-migration (14%) or the child was present at the start of the observation (36%), (Table 15). Thus, the variables have been fixed at different ages of the children, and not consistently at birth.

Chapter 7

GENERAL DISCUSSION

7.1 The importance of the question

A powerful application of health and population studies lies in the enquiry into the outcomes of population processes, and in particular health outcomes. This study demonstrates the presence of an emerging population trend of major social significance, namely an increase in female temporary migration which it is hypothesized can have an impact on childhood mortality of the migrant mothers. Through a cohort analysis, made possible through the data generated by the Agincourt Health and Demographic Surveillance System, the dissertation investigates the relationship between maternal temporary migration and child mortality. Findings should bear on evolving health and social policy in post-apartheid South Africa.

7.2 The hypothesis test result

Based on the findings presented we accept the null hypothesis that there is presently no impact of maternal temporary migration on child mortality. Thus, in the rural Agincourt setting, the migration of a mother in a child's early years does not appear to be a risk factor for child mortality.

7.3 Mother's education status

Findings suggest a positive impact of migration of temporary mothers on child mortality when tested at a univariate level, but this is related to the education status of the mother. The study shows that when women become educated to tertiary level there is a survival advantage to their children; and, moreover, these women are also more likely to migrate.

7.4 Poverty

The data generally describe considerable heterogeneity in this poor, rural society. Households containing a temporary migrant of either sex tend to be economically better off [96]. This study has highlighted greater child mortality risks associated with settled Mozambicans and unmarried mothers, which are risk categories that probably reflect the impact of high levels of social deprivation.

7.5 The strength of social networks

The finding that temporary migrant mothers have no negative impact on the survival of their children is an indicator that despite the negative social effects of labour migration described by several authors, the extended families and other networks are supporting the children of absent mothers. This shows an adaptability since people are already coping

with the strain of growing retrenchments [24], land decay and increasing mortality from AIDS-related conditions.

7.6 Mozambicans

Children born into Mozambican households exhibit a significantly worse mortality profile than their South African counterparts. The analysis shows that while certain other measured factors are predictive of childhood mortality, particularly “age of the mother”, “marital status” and “death of the mother”, these risk factors do not explain the differential mortality of children from different nationality groups [32].

Qualitative work points to the fact that living conditions in Mozambican villages are much worse than those in any of the other village types in the sub-district; the refugee settlements generally have no schools, the quality of housing is generally much worse and they are largely isolated from public transport. An environmental survey conducted in 1993 demonstrated that refugee villages were consistently worse off than ‘mixed’[13] villages with respect to access to water and fuel, and the types of sanitation and waste disposal methods used [31]. These authors point to lack of legal status as a major contributor to the Mozambican’s vulnerability. Exploitation in the workplace leads to economic vulnerability demonstrated by lower consumption of cash goods, with free firewood used in favour of more convenient forms of energy [31]. Legal vulnerability and consequent lack of certainty over the future results in less investment in domestic

[13] Villages containing a mixture of South African residents and settled former Mozambican refugees.

infrastructure such as pit latrines, as well as lack of government and NGO investment in public infrastructure such as water supply and electricity [31].

7.7 Gender of household head

The gender of the household head had no impact on the mortality profiles of children. The hypothesis that gender of head may affect child mortality arose in South African literature and reflected the perspective that the income in female-headed households is on average reduced by at least one adult male salary, as well as having less access to resources and less power to influence their condition in general.

In other Agincourt work female-headed households showed a significantly different membership composition to male-headed households, tending to be smaller, with households less varied in size. It could be seen that the mothers in female-headed households tend to give birth at the more vulnerable ages (12-19 and 40-49) and the mothers were also significantly less likely to be married. The multivariate work reported here indicates that ‘marital status’, coupled with ‘age of mother older than 40’ affected child mortality and not the gender of household head.

7.8 Marital status

A key social factor influencing child mortality is marital status. When a mother is married she enjoys more status and social protection for her children than if she is not. If

an unmarried mother is an earner she can weather this, but if not, the never married or divorced status indicates a poorer outcome for children.

The “unmarried” effect could be exacerbated by child mortality resulting from HIV positive mothers, who may be unmarried. To investigate this possibility would require knowledge of HIV status of mothers and/or their children. Other work shows a low age of sexual debut and high levels of adolescent pre-marital fertility [34]. Young adult women bear the brunt of HIV infection and this, coupled with a lower social status, through the baby being out of wedlock, inexperience at motherhood and lack of power to influence her situation in the household may well combine to result in higher mortality amongst children of young unmarried mothers.

7.9 Young adult women, temporary migration and employment

It could be see in chapter four that young women migrate to obtain a better education. Women with more education want to experience life with more autonomy than is possible in the conservative traditional culture of the rural areas [66]. To a rural household this might also result in a diversity of income and the family may support a migration. The opportunities for a better educated young women range from clerical and small business assistant work to domestic work and informal selling. They are usually unmarried and may or may not have children (see chapter 5). There are dangers of falling prey to crime or the sex industry, especially when networks and employment

opportunities fail, but family networks tend to be strong. Communication between city and rural areas has benefited from recent technological developments and often parents and family are able to keep a watch on young female migrants through city based kin and cellular telephone networks. In turn young women may send vital remittances home, but the regularity of this was not explored in this thesis.

7.10 Health and economic outcomes of female temporary migration

Literature on the impact of migration on household well-being, in terms of health and socio-economic status, largely highlights the breadwinner role of the temporary migrant, which predicts a positive outcome [50]. This has been borne out by the evidence presented in this sub-district study. The most equipped woman in terms of education were more likely to migrate and enter the labour market somehow, and the children of these women were also less likely to die before age five. To some extent social and economic development in the area arises through the efforts of people with more social endowment in terms of skill and opportunity (human capital). This occurs despite the burdens of the segregationist history (socio-political factors), the mortality rates arising from the HIV epidemic (health factors), and a persistent background of poverty (socio-economic factors). The study shows that a large proportion (over 50%) of female temporary migration was for work and therefore impacted on the economic situation in the household. From the perspective of household members the remittances are a leading income stream that sustain the household economy.

A book chapter on households, migration and socio economic status was recently written by the Agincourt migration research team which was still in press at the time of manuscript completion [96]. In this study temporary migration was shown to be positively correlated at a household level with asset index, but slightly negatively correlated with livestock possession. The study was based on the demographic surveillance system data and socio economic status was measured by two variables: a modern asset score, calculated as the number of consumer durables possessed by the household at the time of the 2003 census, including items such as a refrigerator, television, radio, cell phone and access to services like water and sanitation, and livestock assets comprising the number of cattle, poultry and goats. The overwhelming picture that emerged was that having a temporary migrant in the household was a protective factor against 'modern asset' poverty, but resistant to the relationship were the owners of livestock, who had more wealth with less temporary migrants living in their households [96].

There are features of this setting that have arisen due to the segregationist history of the country, and some of the negative impacts of this 'Apartheid' history have been caused by temporary migration. There is widespread poverty in the country and much personal and family cost involved in obtaining an income. There is a high prevalence of disunited families and illegitimate children [2]. The lost opportunity of mutual support of both parents in children's development is a negative social outcome of highly prevalent temporary migration.

7.11 HIV and migration

A recurring theme throughout the dissertation has been the increasing prevalence of HIV infections and high levels of AIDS mortality in this population. There is affirmation in scientific literature that temporary migration is associated with increasing incidence of HIV infection in southern Africa [5, 97] and other parts of sub-Saharan Africa [7, 8, 98]. A study of the sero-prevalence of HIV in rural Kwazulu Natal found a three-fold higher risk of HIV infection among people who had recently changed their place of residence [99]. Mobility increases the risk of HIV and other sexually-transmitted diseases (STDs) seemingly because migrants are more likely than non-migrants to have additional sexual partners [100]. This situation can be exacerbated by rural migrants experiencing emotional instability on exposure to the urban environment, which can lead to 'temporary solutions in serial and potentially high-risk sexual relationships' [101].

A recent set of papers has investigated the female side of disunited family. This part of the story is key for understanding the implication of labour migration on the rural communities to which the migrants regularly return [5]. The situation is changing over time but the social disruption described above affects not only the migrant in the workplace, but also the extent of sexual networking in the sending area [102]. HIV discordance among migrant couples was investigated in a longitudinal study involving migrant workers in mining settings and their partners in Kwazulu Natal . The data showed that nearly 40 per cent of migrant couples with a discordant HIV infection status had an HIV infected woman and an uninfected male migrant partner [103]. This

highlights the occurrence of riskier sex taking place at both poles of the migrant labour relationship, i.e. the labour migrant and his or her spouse.

The Agincourt Male Labour Migration study conducted by Wolff, Collinson and colleagues studied the migration and sexual partnership practices of men, which also showed a higher likelihood of extra-marital partnerships at both poles of the migrant labour relationship [104, 105]. They used logistic regression to estimate the influence of migration and employment status on the likelihood of having multiple partners. The migration categories they used were: long-term migration with a frequency of return of three or less months in the last year, circular migrants with frequent returns (at least monthly), employed non-migrant men, and unemployed non-migrant men. Employed non-migrant men were significantly more likely to report multiple partners in the last year than circular, frequent return migrant men (Odds Ratio of 1.7, p=.04), but employed non-migrants were significantly *less* likely to report multiple partners than were long-term circular migrants (Odds Ratio of 0.4, p=.02). [105]. Men who live and work in the rural villages report more extra-marital sexual partnerships than locally unemployed men, which points to sexual networking in rural villages; another structural factor embedded by the migrant labour system.

What's more, having multiple partners is only part of the story about HIV risk behaviour. Perception of personal risk was low and condom usage was infrequent. Compared to migrant groups, employed non-migrant men were less likely to report using condoms,

and significantly more likely to report symptoms of sexually transmitted diseases than any of the migrant groups. Condom use was not consistent across any groups [104].

In particular further research work is needed to understand woman's risk of HIV infection. A commitment is needed by government and civil society to make men aware of the danger on having sexual partners outside of union. This should not just be for migrant labourers alone, but should include all men.

7.12 The generalisability of the findings

The generalisability of the findings in this population is a good question to end on. This is of importance when considering extrapolating the findings to a wider population. In general, the population of Agincourt represents a typical, former 'Bantustan' area in South Africa's interior provinces. The findings therefore have value in extrapolating to this wider context. They also have value as a case study, which provides detailed information on the specific sub-population. In response to the critique that this sub-population may have unique features resulting from the presence of the study itself, it can be maintained that in the dire absence of vital registration and other information sources it is critical to learn what we can from such a sentinel site. A bias arising from the presence of the study may exist and its magnitude and direction should be investigated, but in all likelihood this hypothetical bias is negligible.

7.13 Summary and conclusion

Migration is both causal factor and an outcome of social transitions worldwide. Contemporary literature emphasises household strategies [51] as a major driving force. The migration process is also driven by migrant networks and there is an inherent momentum in the network [10, 106]. This is maintained by the social links between migrants and their home communities [11], of particular relevance are remittances as a source of income for rural households and the fact that migrants from a particular household can help other migrants settle in the city and obtain links to employment opportunities. But negative forces associated with the burden of the migrant labour system are also well documented [2]. These include loss of skill available to the rural household, children growing up without the support of both parents and exposure to sexually transmitted diseases like HIV.

South Africa's government policies over the last century held the natural population flows in check, allowing predominantly adult men to migrate, while African women were generally forced to remain in the rural Bantustans. When these policies were lifted the situation remained static for a short while, then, in the late 1990's, temporary migration, particularly labour migration, of women started to increase dramatically. Informal sector and low tier work dominated the labour spectrum for rural women. However, education, in particular tertiary education, can be shown to lead to labour market advantages and better employment opportunities for temporary migrant women.

The dissertation examined whether female temporary labour migration was related to higher levels of infant and child mortality. It was found that woman's increased movement has not impacted on child survival. This is a positive result, and occurs despite increasing mortality from AIDS, poverty and family disruption. It should be noted however that this is a community or population level result, which disguises the diverse realities experienced. Single or unmarried mothers with no education are at risk of reduced social and/ or economic support, as are settled former refugees. These situations place children at considerable risk, which strongly indicate the need for appropriate social policy intervention.

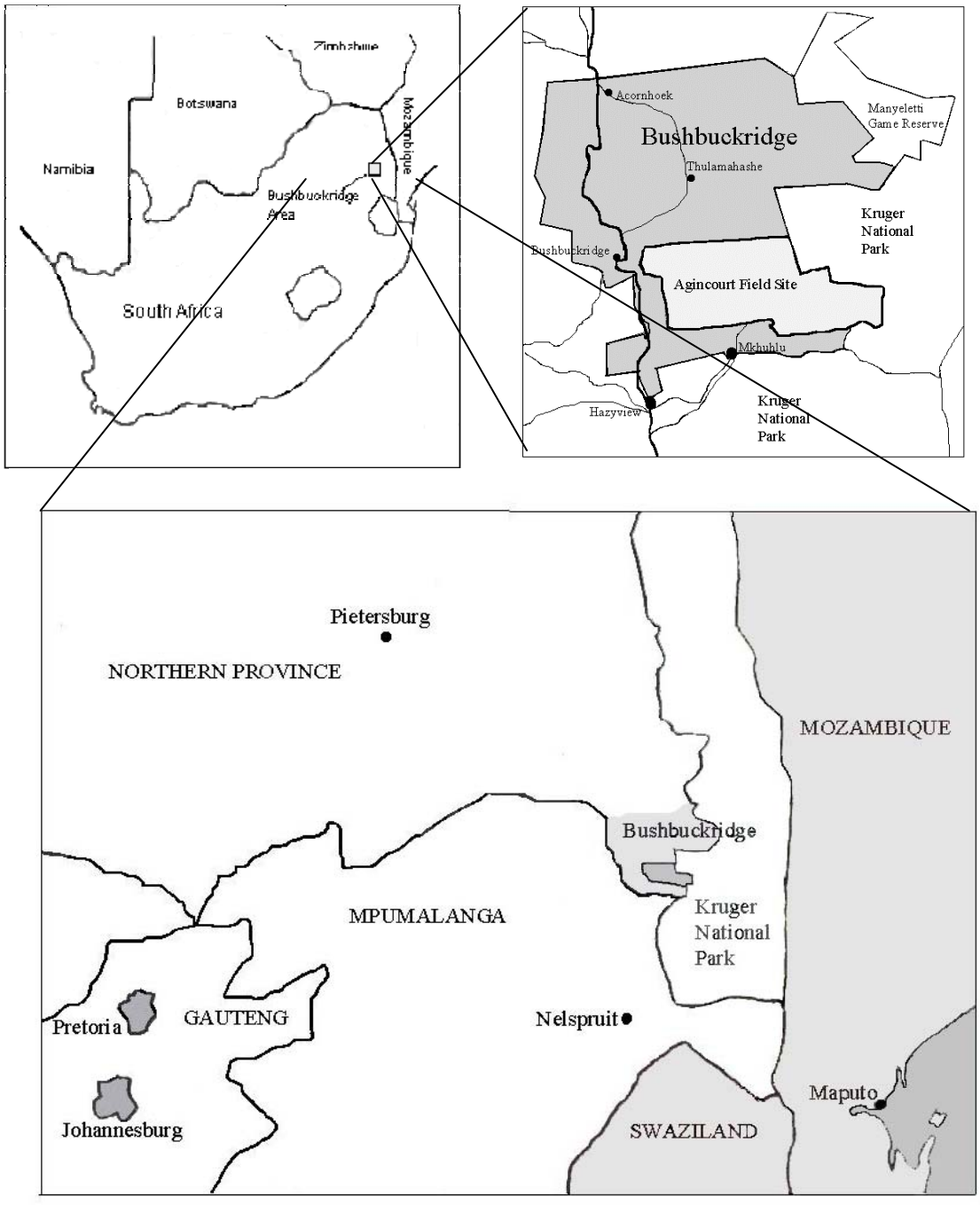
From the perspective of public sector services there is much work to be done to create an adequate response to the burdens of poverty and disease. The special needs of highly mobile populations need to be considered in this response, including issues of continuity of health care between urban and rural settings. Overall, the capability to be diagnosed and treated is paramount, and effectively targeted prevention services are urgently needed. Circular migrants who fall ill at work will return to die in rural areas, where policy must ensure adequate resources are available to treat them. Policy oriented research is needed to help target interventions in the most cost-effective way.

If the high levels of temporary migration cannot be reduced there should be attention paid to the needs of circular migrants, including people who are unable to migrate due to lack of means. The range of interventions can include affordable long-distance public transport, financial services enabling the transfer of money, and communication

infrastructure to enable good links between temporary migrants and their rural homes. Without such policy advances rural households, who actually deserve credit for their role in supporting the growth of the largest economy on the continent, may in reality remain underserved and deeply reliant on circular migration.

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Appendix 1: Map showing the Bushbuckridge District, Limpopo Province, and the Agincourt field-site.



Appendix 2: The Agincourt Health and Population Unit: Origins and Aims.

The Department of Community Health of the University of the Witwatersrand began a constructive presence in rural South Africa in1982 at a district hospital called Tintswalo in the former Bantustan 'homeland' Gazankulu. This remote unit, called the Health Systems Development Unit, sought to document the inadequacies of the Bantustan health care system and intervene with appropriate training and development programmes and policy development. The Unit's primary aim was to inform rural health system development, particularly from primary care and community perspectives. There was a chronic lack of accurate health information for health systems planning. Information from national censuses could not be trusted due to consistently and hopelessly inaccurate undercount. Data from health care facilities was inaccurate due to inefficient health information systems, and a strong bias created by the fact that only a proportion of the population used the health services. These were the better educated, the better off, or those who lived nearby a facility [36].

The dual need of obtaining reliable information for planning, and addressing the challenges of health reform accompanying political transition, notably decentralizing health system management, resulted in the formation of a new research and development initiative in 1992, the Health Systems Programme of the Health Systems Development Unit. The strategy was to demarcate a sub-district field site and introduce/ evaluate local health programmes; in addition to conducting demographic surveillance as a basis for the health and population research. An administrative sub-district was chosen using the following criteria. Firstly, it had to be rural in terms of distance from major towns, lack of

tar roads and basic infrastructure. Secondly, there needed to be a health centre and satellite clinics, which could form the nexus of a decentralized sub-district health system. Finally, a population of settled Mozambican refugees was included, many of whom fled their country's civil war in the early to mid-1980s and remained as so-called 'self-settled' refugees. This sub-population has compounded vulnerabilities due to variable legal status in South Africa.

The site chosen was the Agincourt sub-district of Bushbuckridge in the Limpopo (formerly Northern) Province. The original stated objectives of the Agincourt study were the following:

a. To provide essential information on the demography, health status and fertility status of the Agincourt community as a basis for the improved formulation, implementation and assessment of district-level programmes.
b. To serve as a sentinel field site providing accurate information on the population dynamics of rural communities in South Africa to inform the evolution of rural health and development policy.
c. To provide the capacity and a database to support more advanced community based studies and field trials in the future [107].

Given the dearth of information and limited understanding of rural health status and determinants, the current objective relates directly to the latter one, namely to provide a research infrastructure and longitudinal database for a range of community-based studies

relating to burden of disease, health system interventions, and the social, household and community dynamics in this setting [30].

Appendix 3: Challenges in the study of migration at Agincourt

An issue which occasionally recurs with the Agincourt household definition is that the respondents sometimes don't recognise or declare an in-migration in the expected way and a new household member may be declared to have always been resident. This probably arises from household members having less strict boundaries for household membership than is used in the Health and Demographic Surveillance System. An outcome is that the 'move' is not recorded and data such as the reason for migration is not captured.

Another issue is that a temporary migrant may never return, as in a desertion scenario. The temporary migrant becomes an out-migrant by breaking the link with the rural household. The family, however, may not accept this and require that the HDSS retain the out-migrant on the household list of residents in hope of their return. But, the number must be small, since less than 3% of the temporary migrants were reported as not having returned for more than a year.

Some challenges arise generally in the study of migration and health. These are primarily related to the complexity of the research topic. Migration definitions require both a time and a space dimension [3, 48], and for this reason standardised definitions between migration projects are very hard to find. Furthermore, endogenous relationships exist between health, socio-economic status and population mobility, which means there are bicausal relationships between these three domains. The nature of these relationships is affected by wider structural factors, as mentioned in the introduction, p.1, (operating at

national, regional and even global levels). These relationships are also mediated by socio-cultural norms in the society.

Data limitations also exist. Conventional demographic datasets (e.g. censuses, Demographic and Health Surveys, and other national surveys) are often limited in studies of population movement. Migration concepts are hard to standardise operationally, people's migration history can be complex, de facto household definitions tend to be used in data collection, whereas de jure definitions better capture the social reality of the household.

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